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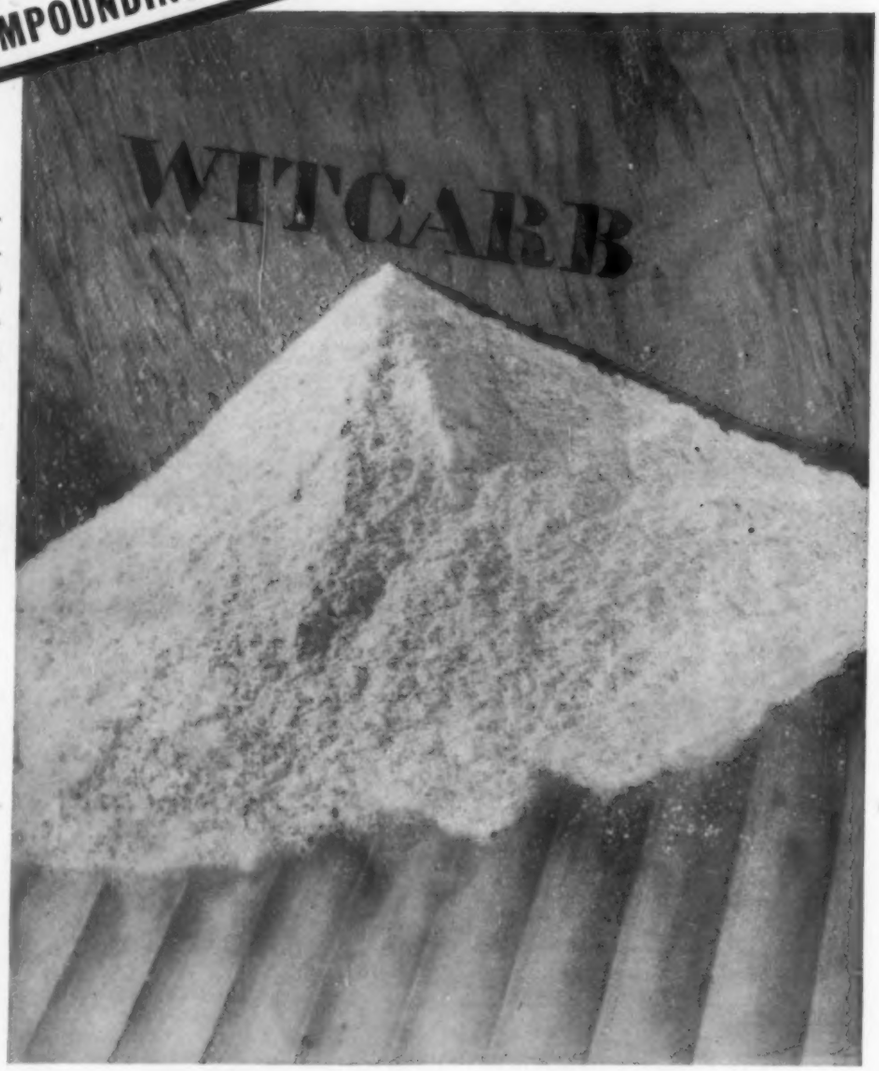

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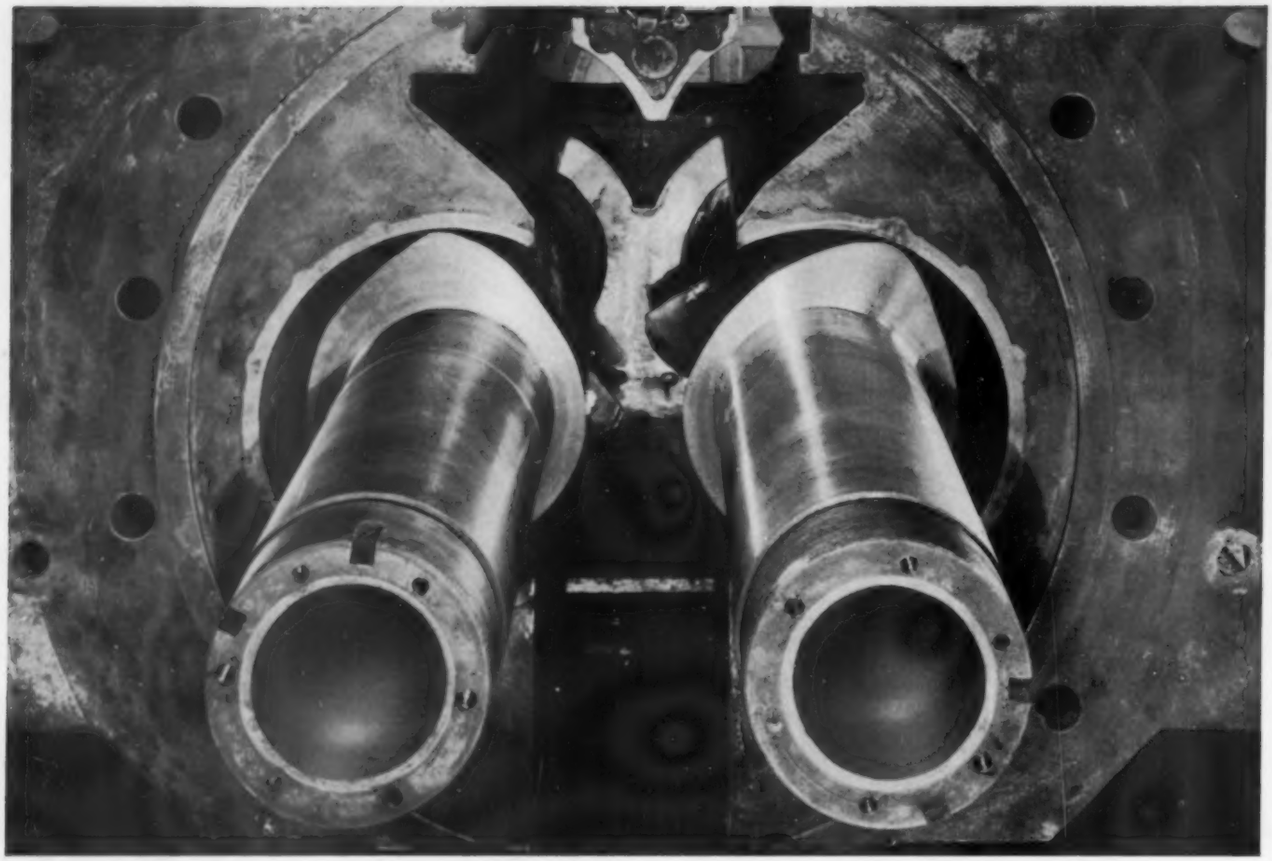

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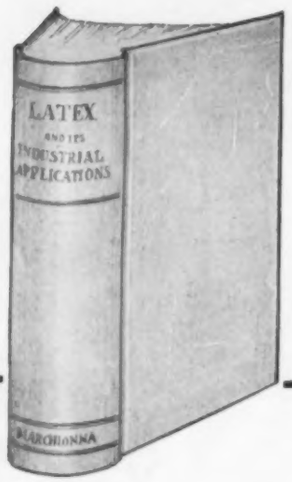

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VOL. 49, No. 1 **APRIL, 1941**

ELECTROCOATING

A Method of Depositing, Orienting and Dispersing Finely Divided Material by Means of Electrostatic Field Forces

By JOHN O. AMSTUZ

Chief Engineer, Behr-Manning Corp., Troy, N. Y.

ELECTROCOATING was first applied in the manufacturing of coated abrasives *(1)*. It is a relatively recent development and consequently very little concerning it has been published. The principles of electrocoating are quite simple. Centuries ago it was discovered that chips of wood, paper, or other irregularly shaped pieces would stand on end and be attracted or repelled under the influence of an electrostatic field. This phenomenon led to the discovery of the electrocoating process.

Small crushed mineral particles, such as flint, garnet, aluminum oxide, silicon carbide, emery, or fibers of rayon, wool, silk and cotton, are carried by a belt conveyor into a strong electrostatic field. Moving over the belt conveyor is a ribbon or web of adhesively coated paper or cloth, called the backing. Two electrodes, similar to condenser plates, are required to establish the electrostatic field. One of the electrodes is located underneath the conveyor belt. The other one is placed above the backing. The arrangement is shown in Fig. 1.

The top electrode is grounded and the bottom electrode is connected to the high tension terminal of a transformer or a kenotron rectifier set. The air space between the electrodes is about two centimeters. Electrode spacing and voltage between the electrodes are adjustable.

Fig. 2 illustrates how an electrostatic coating unit is installed and used in connection with a commercial coating machine. The backing, paper or cloth, is coated on one side with a suitable adhesive. This can be done by means of a doctor blade as shown in Fig. 2 or with a pair of coating rolls. The coated backing, with the adhesive facing down, is passed in between the electrodes. Finely divided particles are fed uniformly from a hopper through a screen onto a conveyor belt which carries the particles into the electrode spacing. As soon as the particles enter the electrode spacing they are polarized and charged due to the high intensity field which exists between the electrodes, and since the lower electrode is connected to the high side

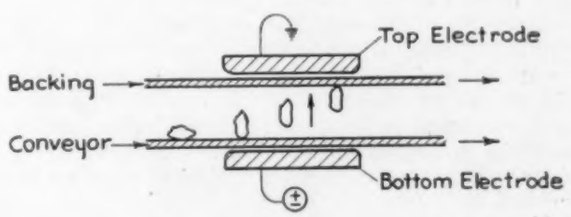

FIG. 1—Arrangement of electrodes.

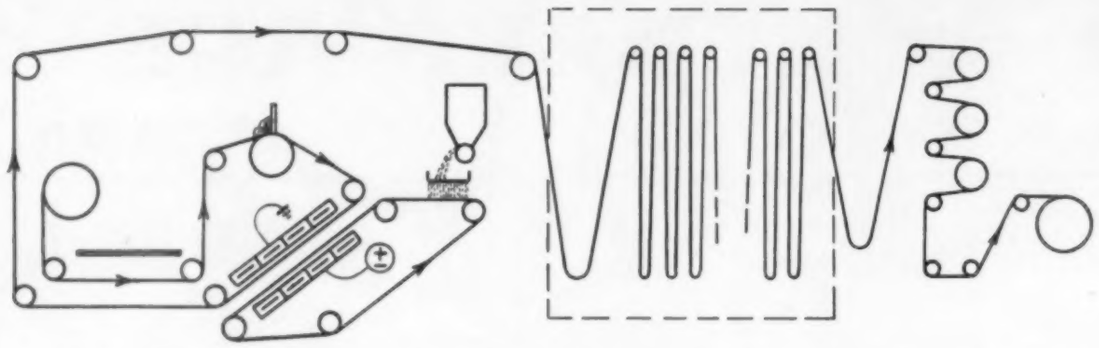

FIG. 2—Diagrammatic sketch of an electrostatic coating unit.

of a potential source, particles in contact with the lower electrode acquire a charge which is of the same polarity as the bottom electrode.

According to the Coulomb law these particles are repelled by the bottom electrode, and they are hurled into the adhesively coated backing where they are retained, standing on end, uniformly spaced from each other. When the electrocoated backing leaves the electrodes, the particles are securely anchored in the adhesive. It is then looped around the machine and led into a dryer for curing from where it is taken down and rolled up after the cure is completed.

The force acting on particles in a homogeneous electrostatic field is a function of the field intensity E and the particle charge ne, or

$$F = E \cdot ne \qquad (1)$$

The field intensity depends primarily on the voltage applied to the coating electrodes. The maximum field intensity between two flat electrodes is limited by the dielectric medium, the particle concentration and the particle size. If no particles are in between the two electrodes, with air as dielectric, it is

$$E \text{ max} = 120 \cdot \frac{b}{273 + t} \text{ Kv/cm} \qquad (2)$$

E max = field intensity in Kv/cm (peak value)
b = barometric pressure
t = temperature in degrees centigrade

With particles in between the electrodes the value of E max falls to

$$E \text{ max} = C \frac{b}{273 + t} \qquad (3)$$

where C is a constant depending on particle concentration, particle characteristics and particle size. It drops for rayon fibers of 3.5 denier and .025-inch length to 105, instead of 120 for air alone.

In order to prevent formation of arcing between electrodes, especially when voltages are used near the breakdown value of air, it is necessary to insulate the charged electrode. Under certain conditions, according to the material to be coated, it is advisable to insulate both the grounded and the charged electrodes. Fig. 3 shows an arrangement with the bottom electrode insulated.

The field intensity in the coating space is then calculated as follows *(2)*:

$$E_2 = \frac{V}{a_2 + a_1 \frac{\delta_2}{\delta_1} + a_3 \frac{\delta_2}{\delta_3} + a_4 \frac{\delta_2}{\delta_4}}, \text{ where} \qquad (4)$$

E_2 = Field intensity in coating space
$\delta_{1,2,3,4}$ = Dielectric constants
$a_{1,2,3,4}$ = cm.
V = Voltage applied to electrodes

Particles are charged by contact with the lower electrode and by electron bombardment while floating in the field between two electrodes. Experiments and theory indicate that most particles are charged very rapidly, in a fraction of a second, while polarization occurs instantaneously. Particles charged by contact with the lower electrode should theoretically acquire a maximum charge of *(3)*

$ne = 6.4 \pi r^2 \sigma$, where
ne = charge on particle
r = radius of particle
σ = charge/cm² on bottom electrode

The maximum charge which a particle can get by induction while floating between electrodes is *(4)*

$$ne = \left[1 + 2\frac{\delta - 1}{\delta + 2}\right] E r^2 \qquad (6)$$

where: ne = charge on particle
δ = dielectric constant of particle material
E = field-intensity in coating space
r = radius of particle

The particle charge is, according to the above, theoretically a function of the particle radius and the charge density of the lower electrode while the particle

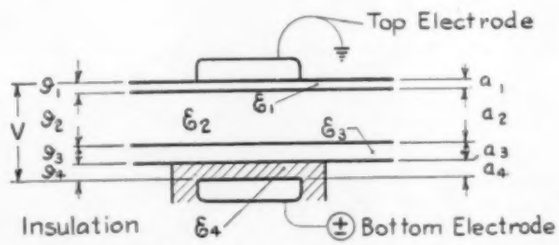

FIG. 3—Method of insulating bottom electrode.

is in contact with this lower electrode, or it is a function of the dielectric constant of the particle material, the field intensity and the radius of the particle while it is floating in between the coating electrodes. In all the above it is assumed that the particles are of spherical shape.

In electrocoating, very few instances are encountered where spherical shapes are used. Most particles are of irregular shape with sharp edges. They do not respond to the electrostatic field like spherical particles. Sharp pointed particles can not be charged like those with smooth surfaces. The charge on irregular particles depends on many factors, such as field strength, particle shape, particle size, dielectric constant, temperature, humidity, conductivity over the surface of the particle, conductivity through the particle, electrode polarity, surface density of electrodes, wave form of electrode supply voltage, number of cycles applied when coating with alternating current, time of contact with lower electrode, etc.

Determination of Particle Speed

Experiments show that only particles having a weight of not more than approximately two milligrams can be lifted. By subjecting a particle to an alternating current field it is possible to move it in step with the cycle. In other words, there is a definite relationship between particle size and characteristic, and the cycle of the electrode potential. This relationship permits the determination of the particle speed by adjusting the cycle to the mass of the particle in such a way that the particle movement coincides with the number of cycles.

From the particle speed and the time which the particle requires to travel from the lower to the upper electrode, what charge the particle carries can be figured. Experiments conducted on charged particles show that the actual charge on irregular shaped particles is only a small percentage of the theoretical charge expressed in Formulas 5 and 6.

For electrocoating, alternating current is preferred to direct current as a source of supply for the coating electrodes, especially when coating cotton, rayon or similar fibers. Alternating current results in higher densities and more uniform particle deposition. Direct current has a tendency to form strings because some particles clinch together like magnetized nails, and are likely to short-circuit the field. Figure 4 shows what is meant by string formation.

In the electrostatic deposition of particles, serious consideration must be given to the viscosity of the

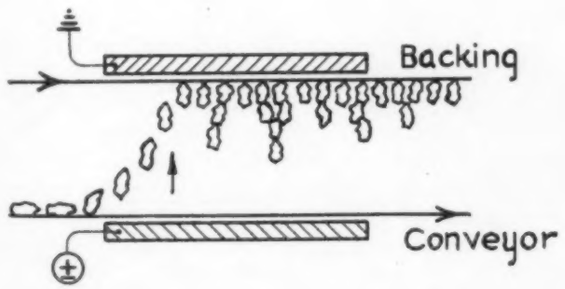

FIG. 4—Explanation of string formation.

FIG. 5—Enlarged cross-section of fibers.

adhesive so that the required penetration will result from the velocity which the particles attain under the influence of the field. Where this velocity is great, as with particles of small mass under the influence of a powerful field, the viscosity can be at its practical maximum. Any sacrifice of this velocity, such as by increasing the mass of the particles or by field characteristics that are not ideal, must be compensated for by a reduction in viscosity of the adhesive, in order that the required penetration will result. This is probably the basic requirement for an adhesive for electrocoated pile fabrics and any adhesive can be used provided the viscosity of its solution or dispersion is controllable. It is obvious that such materials as rubber and its synthetic cousins, reclaims, resins, oils or combinations, are adaptable to this process in the form of solutions or dispersions.

Use of Rubber in Electrocoating

Where a final flexible product is required, the use of rubber is naturally indicated. Whether this will be used in form of latex dispersions or as solvent cements depends largely on the type of fibers used. The aging of the rubber compound must be sufficient to retain the fiber anchorage throughout the life of the product under service conditions. While this would have been a rather large order some years ago, it is fortunate for the electrostatic process that rubber compound technique has advanced to the point where such aging is possible with a good factor of safety in such large volume products as automotive fabrics. Also in the case of such products as carpets, where great flexibility is not required, the advent of the electrostatic process is most opportune. Fig. 5 shows an enlarged cross-section through a piece of electrocoated material. The fibers which happen to be cattle hair are deposited electrostatically and they are held onto the backing with rubber cement. The curing of latex and rubber cement is critical and must be under accurate control.

Attractive materials can be produced in the dress goods line where cotton or rayon fibers are cut to even length and deposited electrically onto a printed or dyed light voile. Designs are first printed onto the backing with a suitable adhesive. They are then electrocoated with fibers and resemble in its final form fine embroidery. The fibers are uniformly spaced; designs are fluffy and deep. The shadows in Fig. 6 indicate their depth. Some patterns which can be produced are illustrated.

It is surprising to find that densities of 250,000 to 300,000 fibers per square inch can be obtained, all fibers standing perpendicular to the surface.

The wear of fabric is approximately proportional to the density. Woven fabrics can not be made as

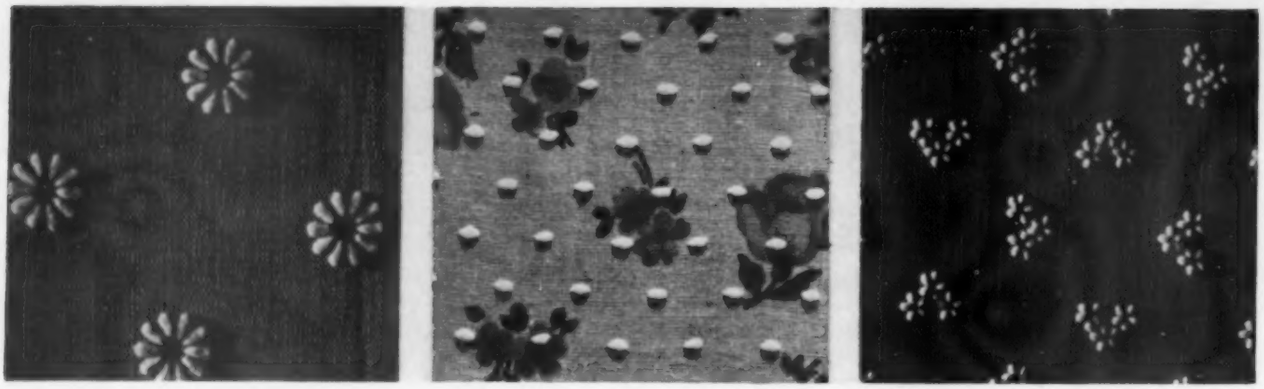

FIG. 6—Patterns which can be produced by the electrocoating process; the fibers are uniformly spaced.

dense as electrocoated fabrics which is one reason why electrocoated fabrics outwear the woven ones by a surprisingly great margin. Wear tests on standard textile testing machines show ratios of 1 to 3 in favor of electrocoated fabrics.

Adhesives used in electrocoating are difficult to manufacture. Electrocoated fabrics are made for industries which have set up extremely severe specifications and they have to go through many wear and aging tests. Binders, for instance, as used on dress goods must be flexible. They must stand dry cleaning, washing, ironing. Adhesives which meet such requirements are specialties which can not be purchased. They are made to order and can only be produced and applied after extensive research and long practical experience.

Each electrocoating process presents its own adhesive problem which must be solved before successful electrocoating is possible. There are numerous interesting problems left for scientists and engineers to be solved and much work is left to be done for clearing up the laws and relations of particle motion and the behavior of particles under electrostatic field forces. There is also much work left to be done on suitable adhesives and practical coating methods.

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Factex Vulcanized Oil Dispersion Type A

FACTEX Dispersion, a new compounding ingredient for use in rubber latex, which consists of partially vulcanized fatty oil dispersed in water, was recently introduced by the Stamford Rubber Supply Co., Stamford, Conn. Polymerization in the dispersed phase produces an elastic product. The degree of polymerization is carefully controlled so that the dispersion, when dried, produces a non-tacky elastic film. Because of its fine particle size and its affinity for latex, comparatively large quantities of the new dispersion may be used in latex compounds, according to the manufacturers, without reducing the tensile properties of the product.

Factex Dispersion contains 70% solids and may be used up to 20% on the rubber without influencing the physical properties of the product, and up to 30% when tensile properties are not of primary importance. Its use results in a dry, non-tacky surface with a smooth feel. It solves many latex processing problems at only slightly increased modulus. Good adhesion of the film is maintained when not yet dry.

Advantages of the new vulcanized oil dispersion, according to Stamford Rubber Supply, are many. Disadvantages are color and odor. The brown color of Factex Dispersion restricts its use to colored goods. Its smoked sheet color, however, produces an amber transparent stock without additional coloring matter. The slight H_2S odor of the dispersion completely disappears after storage of the goods.

This is distinctly an advantage of the new material

The new dispersion is highly stabilized and may be mixed into latex by simply stirring. It is advisable, however, to mix it in ammoniated latex, and if it should be necessary to reduce the ammonia content it should be done only after the mixture has been allowed to stand at least one day.

In mixes which are destabilized before use, the actual quantity of destabilizing agent will need to be determined, because the stability of the latex increases after the addition of the dispersion.

Petroleum in Rubber

A Complete Review of the Present Uses of Petroleum Products in the Compounding of Rubber and Some Possible Future Uses

By JOHN B. TUTTLE

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RUBBER and petroleum are two of our most widely used hydrocarbons. Their consumption in the United States exceeds that of the rest of the world. Their combined application has made possible one of modern man's necessities—transportation. In the past, man required food, shelter, and clothing. The twentieth century added rapid individual transportation. Rubber tires and petroleum fuels and lubricants made this possible.

The United States possesses over sixty per cent of the known petroleum reserves of the world. We produce practically no rubber. The present international situation has made us acutely aware of the latter fact and we have turned to petroleum, the hydrocarbon raw material we have in abundance, to prepare natural rubber replacements. The character of these new products and their production is well known, having had recent attention in technical journals and elsewhere. I do not therefore intend to discuss synthetic rubbers and their relation to petroleum, but rather the run-of-the-mine rubber compounding uses of petroleum—what has been used in the past and what we may expect to use in the future. Petroleum refining is changing rapidly and we should appreciate how such changes affect the products used in rubber processing.

The compounding of rubber and its reclaiming make use of almost every type of petroleum derivative. As the petroleum refiner expanded the number and type of products prepared from his raw material, the rubber chemist tried them and continued to use those adapted to his needs. This has frequently extended the utility of rubber through lowered production costs or made possible a new rubber article. The petroleum thus applied ranges from volatile fractions such as commercial normal heptane to oxidized asphalt—mineral rubber. We may consider them in order of decreasing volatility.

Dipped goods and coated fabrics were rubber applications making early use of petroleum. Both required a solvent which would swell and dissolve rubber, evaporating to leave it unimpaired in strength, odor, and color. Production requirements dictated a wide range of boiling points; materials which were non-toxic to personnel and inexpensive enough to make recovery uneconomical in most instances. The petroleum refiner supplied solvent naphthas which early became the standard of excellence of the rubber industry. When first used, the petroleum engineer was still feeling his way about in his hydrocarbon world and the solvents supplied the rubber processer left much to be desired in stability during storage, odor, and width of boiling range. As the oil chemist became increasingly aware of rubber needs, the solvents were improved until today there is question as to what improvement we can expect of the future.

Normal Heptane a Pure Hydrocarbon

The lowest boiling commercially applied petroleum fraction is normal heptane. It is obtained largely from natural gas and natural gasoline simply because it occurs there in quantity and its separation is easily accomplished. Its odor is excellent, modern refinery design having made its narrow boiling range and purity all that can be desired. Since it is practically a pure hydrocarbon, there seems little that can be done to better suit it to rubber needs. Its price is low and the supply is adequate for known rubber uses.

A less volatile solvent group includes materials with boiling ranges of 100° to 400° F. They are usually designated commercial solvent naphthas and have numerous uses outside rubber manufacture. When first prepared, their manufacture consisted simply of distillation to obtain the desired boiling range, and this was not, at that time, nearly as narrow as it has since become. As the technique of handling petroleum advanced, the boiling range was narrowed until it reached its present range of approximately 100° F. from initial to final or dry point. The distribution of this range has been improved to aid drying and improvements in uniformity have been noticeable.

Most reputable manufacturers refine their materials with modern equipment which may involve vacuum distillation. The raw material used is selected to give solvents with the greatest possible initial stability

Note: This article is based on a talk given by the author before a meeting of the Boston Group, Rubber Division, A.C.S., held on March 28, 1941.

against deterioration during transportation and storage. Stability has been further improved through chemical treatment, which has also made the odor less noticeable and improved the color. Sulfur compounds present in some raw materials have been largely removed along with those unsaturated components tending to form gum or oily residues which would remain in the rubber article to give an odor or act as a permanent softener after the volatile portion has evaporated.

Varnish Maker's and Painter's Naphtha—commonly called V. M. & P.—with a boiling range of 200° to 300° F., is a less volatile solvent occasionally used. While its primary application lies in the protective coating industry—paint, varnish, etc.—the rubber user has benefited through the changes this other industry has imposed on the supplier of petroleum solvents. These improvements include narrowed boiling range, freedom from gum forming constituents, good odor, and low cost.

Stoddards Solvent, originally developed for dry cleaning, finds limited use in rubber except as a cleaning fluid or as a substitute for turpentine in varnish or lacquer formulae. The refiner has, through selection of crude and method of refining, markedly improved the solvent power of this petroleum fraction, vastly extending its utility in the coating field. However, there has been little urge from the rubber processer to alter the solvent power of the lower boiling fractions. Had there been, the rubber industry would be making wider use of one of the newer petroleum solvent developments.

The rubber chemist early found that coal tar fractions such as benzol gave lower viscosity cements for a given rubber concentration than did petroleum solvents. This was a real advantage to the fabric coater who could thereby step up the rubber content of his cements with consequent reduction in solvent and processing cost. However, the industrial hazards with coal tar materials became known and in many cases it was better to use more of a petroleum solvent and avoid them. Toluol and xylol were less subject to this limitation but their boiling range did not fit them as well to proofing and similar rubber applications. Also, their price varied widely since their availability was directly connected to coke production which in turn was related to steel production.

Solvent refining of lubricating oils was first accomplished in laboratory units of this type.

Some New Aromatic Type Naphthas

Desiring to meet the needs of some of the new resins and further extend the use of hydrocarbon solvents in the coatings industry, the petroleum chemist studied crudes and their refining and evolved solvents in most respects equal to the coal tar materials with the exception of benzol. These were first made by hydrogenation, which was supplanted by solvent extraction at low temperature. The solvent power, boiling range, color, odor, etc. of these new aromatic type naphthas are commercially equal to coal tar products and they have released using industries from the fluctuations of by-product coke production. They give lower viscosity cements for a given rubber concentration than do conventional naphthas, but in few cases in rubber have they justified their added cost. Their rubber use is therefore limited and the petroleum refiner finds their greatest market in other fields.

Catalytic cracking as a revolutionary refining tool has had considerable publicity, and its widespread adoption may not be without effect on solvent manufacture. In the past most gasoline production has been through thermal decomposition of petroleum under pressure at elevated temperatures. Catalytic cracking introduces a chemical aid to direct and accelerate this decomposition. One of the by-products of this type of refining may be naphthas with solvent power above those secured by conventional means. There is doubt if this improvement can approach that attainable through solvent extraction, and the solvents may therefore be of even less utility than the aromatic type naphthas now available.

Considered as a group, it is not easy to see how petroleum naphthas can be much improved to better fit them for rubber use. Some reduction in width of boiling range may be made but there is question of how much this is actually worth in rubber work. Some feel the present boiling range of about 100° F. is as good as it can be when balanced against the added cost of reducing it to 50° or 60° F. Such a change may be expensive since it may limit the utility of the solvent in other industries and thereby add to the refiner's cost of segregation and storage. The odor and color of present materials as well as their storage stability is adequate for all practical purposes although it will undoubtedly be improved as refining technique progresses. Solvent power has already been improved but at a cost which makes it of little advantage in rubber applications.

It seems likely, therefore, that the rubber solvent of the next few years will continue to be of petroleum origin and that its physical character will be not radically different from present materials. This generalization is subject to all the hazards which make it difficult and inaccurate, in this case particularly the

trend to synthetic rubbers. However, many of those known today behave in petroleum solvents much as do natural rubber except in degree of swelling or solubility. Some are much less affected by petroleum and some new solvent combination may be necessary if they are to be handled as cements. If they can be reduced to latex form the use of solvents will be unnecessary, as solvents are not now required by quite a part of the dipped goods and adhesive industries.

If high solvency is necessary the refiner has already prepared such materials, and if entirely new solvents are required petroleum may provide both raw material and technique of obtaining them as it has for alcohols, ethers, glycols, ketones, etc.

In connection with the proofing or coating of fabrics with rubber, additives have been studied to determine their ability to lower the viscosity of the cements made with petroleum solvents. Materials tried have varied in nature from simple normal butyl alcohol to sulfonated hydrocarbons of fairly complicated structure. Also this has been a field for trial of all the new chemical surface active or wetting agents. Would one of them prove the answer to the proofer's dream of high solids content with low viscosity and consequent high machine speed? So far none of them have, and the search goes on. Petroleum refining produces a single material in this field, sodium petroleum sulfonate, derived in the manufacture of white mineral oils.

Sodium petroleum sulfonate is dark to light brown in color and is usually available either in water or oil solution due to practical production limitations in handling the pure material. It is manufactured only by those refiners preparing white oils and finds its greatest fields of use in fat splitting and in preparing emulsive mineral oils. It is entirely soluble in hydrocarbons and has the property of making them yield oil-in-water emulsions. It is quite stable chemically and when present in fairly small amounts, reduces the viscosity of a petroleum naphtha rubber cement appreciably. It has enjoyed limited use and the reason is not entirely evident.

Perhaps the petroleum refiner has not promoted this use or there are drawbacks which are not generally known. There is little general knowledge of the effect of sulfonates on rubber when left as a residue after dipping or proofing, and here may lie the cause for their limited use. Here is a unique petroleum product which, it seems, deserves more study to define its rubber utility. As the use of white oils extends through industry, the quantity of sodium sulfonate available will increase, and it should be attractive to the cement manufacturer.

"Burning Oil" Used in Mechanicals

In its earliest days petroleum proved a ready source of illuminants and refining was largely dedicated to making more and better "coal oil" or "rock oil" for this use. Less volatile than naphthas and gasoline, kerosene finds little rubber use. However, the next higher boiling cut, termed by the refiner "burning oil", has enjoyed wide use in molded mechanicals and similar rubber goods. Available usually under a brand, it has a boiling range of about 500° to 675° F. (atmospheric) and a flash point of 250° F. or higher. Added to hot rubber on the mill it shortens breakdown time and aids in the incorporation of pigments and other compounding agents. The boiling range insures

Modern refinery equipment, such as that depicted, make possible today's rubber solvents.

a minimum of permanent softness and mixes containing it flow better in intricate molds.

The quality of these oils has been largely dictated by their illuminant use but this has not hurt their rubber utility. Rather it has aided it. In processing, the oils are treated to remove unsaturated constituents which would interfere with burning quality, and the result is a softener with minimum effect on the oxidation characteristics of the rubber in which it is incorporated. Also, this same treatment limits its odor and color, fitting it for use with pastel shade goods intended for special applications.

Here again, unless the synthetic rubbers impose new requirements, it is difficult to see how the petroleum refiner can improve his material much beyond its present level. The solvency or softening power of this fraction may be somewhat increased through raw material selection and method of refinement. The refiner has already done this for the ink industry, providing a special high solvency cut boiling between 500° and 600° F. for high speed printing of periodicals such as "Life".

Use does not dictate that the solvent be as free from odor and color as when intended for rubber softening, although this might be accomplished. Thus, if high solvency is desired in this volatility range it can be obtained although it will increase cost through limited utility outside the rubber industry or through the expensive refining steps required. The petroleum industry from its beginning has been a large volume producer and an expensive item must either be handled in large volume or require little refinement. Small quantity materials necessitating complicated refinement are always expensive due to the basis on which the industry has been founded.

In use petroleum is a foe of rubber due to a pronounced softening effect on it, both before and after vulcanization. This effect has been turned to advantage by the rubber manufacturer in reducing the

power requirements of rubber during mastication, thereby creating one of the largest uses of petroleum in rubber. The fraction usually used is a pale, straw-colored, mobile liquid at room temperature, not volatile enough for distillation at atmospheric pressure. The oils are slightly higher in viscosity than those the refiner calls spindle oils and have flash points of about 340° F. They are produced in large quantities for use outside the rubber industry, and the rubber manufacturer gains the low cost advantages of volume production.

Oils Differ in Softening Power

The oils may be made from either paraffinic or naphthenic crude through acid treatment or solvent extraction. The resulting oils differ mainly in their softening power for rubber, the naphthenic having the greater ability to soften due to its chemical character. This is best shown through aniline point determination, which is always lower with a naphthenic type oil than with a paraffinic one. This ability or difference is more noticeable when handling synthetic rubbers which are less amenable to petroleum softening than natural rubber.

It is puzzling to the refiner why so many rubber producers insist on receiving paraffinic oils. Bought in large quantities, the naphthenic oils are cheaper, their specific gravity is higher than that of paraffinic oils, their softening power is greater, and they are more compatible with rosin, etc., when used to prepare mixed softening agents. Also, they contain little petroleum wax and consequently have minimum tendency to bloom in stocks containing the maximum amount of solid compounding. In spite of all these advantages many rubber plants go on insisting on paraffinic oils.

Since naphthenic oils have objectionable characteristics for other applications, the petroleum refiner has devoted considerable time to fitting them to these needs through changes in refining. Solvent refining is one of the most successful methods. To understand how this is accomplished we must be aware of the heterogeneous chemical nature of the lubricating oil fraction of crude petroleum. It consists of a mixture of hydrocarbon isomers, differing both in structure and molecular weight. The sum total character of all then determines the character of the finished oil.

As knowledge of these components increased, it was realized that some of them are much more desirable than others, and the refiner set about finding methods of concentrating those he wanted. At first this was done by reaction with some agent such as concentrated sulfuric acid. The acid reacted with the less desirable elements of the oil, oxidizing them to a sludge which could be discarded after which the remainder was neutralized and filtered to color.

While this method served for a long time and is still frequently used, the reaction with acid is difficult to control, it is expensive since some of the oil and the acid are largely lost, and it is not a continuous process. Search for better ways developed solvent refining, which utilizes solvents to concentrate and separate the less desirable portion of the lubricating oil fraction just as it improved the solvent power of the naphthas.

In operation, the oil is countercurrently treated with portions of solvent, each removing some of the material of greatest solubility. The solvent is recovered and reused, and the resulting two or more fractions are ready for use or for further processing. The result of extracting a naphthenic oil is one fraction which is much more like a paraffinic oil and therefore of greater value for lubricating use. The other fraction contains a greater concentration of the original unsaturated or naphthenic elements and should be a better rubber softener, particularly when used with refractory synthetic rubbers. To this phase of refining, we may look for changes in the next few years.

At present the refiner converts these extracts to fuel oil or some other outlet since the present market for them does not justify segregation and separate refinement. If the rubber industry finds these of value they will be segregated and prepared to the same quality as present softening oils. They possess unique character and the petroleum industry is ready to work with anyone interested in them. Their utility remains to be established, but the refiner believes they warrant the attention of the rubber industry.

Beyond extending the use of these extracts there seems little outlook for progress in the field of low viscosity softeners. Present oils, both paraffinic and naphthenic, seem satisfactory in quality and will be displaced by the extracts only if there is a price or solvency advantage. Aniline point or the lowest temperature at which the oil forms a clear solution with distilled aniline has been established as a good measure of solubility or softening power, so the rubber processer has an easy means of estimating this quality before he tries any low viscosity softening oil in a given compound.

Reclaiming and the manufacture of such permanently tacky items as friction tape has always made use of high viscosity softening oils obtained from higher boiling parts of petroleum, but similar in general chemical nature to the low viscosity softening oils. Here again the refiner of both naphthenic and paraffinic oils wonders why such a large part of the rubber industry insists on paraffinic oils. In some cases it may be a desire for high flash point, *i.e.*, low volatility for a given viscosity, but the difference is seldom great and the application does not appear that critical. Naphthenic oils are cheaper, have better softening power due to low aniline point for a given viscosity, and their unsaturated chemical nature should make them preferable in reclaiming. Many refiners have both oil types available and they should be considered.

High Viscosity Lubricating Oils

Solvent refining will probably benefit this field as it has that of low viscosity softeners. The refiner is applying solvent technique to high viscosity lubricating oils as well as the lower viscosity material and will have extracts which should be interesting in reclaiming and in the production of tacky materials. Like the low viscosity extracts, the refiner now has no ready outlet for the heavier materials, and their segregation and price will depend on the extent to which they are adopted and applied in rubber and elsewhere.

Next in volatility is crystalline petroleum wax which was first separated from crude oil in 1865 by chilling the oil in canvas bags in a refrigerated box, the oil dripping through the cloth, the solid wax remaining behind. Alone of all the refining processes, it has undergone little change except in the size and type of equipment used in the chilling and the expression.

The refiner has learned to chemically refine his wax to secure freedom from color, odor, and taste to fit it to its major use, the coating of paper and containers. This accomplishment suits it also for most rubber uses and the melting points ranging from 120° to 150° F. are adequate for most rubber uses. Many rubber applications do not even require the degree of refinement necessary for food containers, etc., and use what is commercially known as White Crude Scale Wax, which is not as light in color as Fully Refined Wax and contains a small amount of oil.

Possibilities of Domestic Waxes

Paraffin wax "blooms" out of most rubber compounds if it is present above a certain percentage. Since it is frequently desirable to exceed this optimum, other waxes such as montan have been in general use. Montan wax, derived from peat or lignite, is prepared exclusively in Europe. The present international situation has led many rubber compounders to look to petroleum for a replacement. Unfortunately such has not been forthcoming and there seems little chance of making it, particularly when we must consider the price at which the imported wax reaches us during normal times. In general, crude montan was laid down in New York for somewhere near the price of 133/135° F. melting point refined petroleum wax. The refiner cannot hope to take wax or asphalt, his two cheap solid raw materials, and add the cost of complicated refining or chemical processing to yield a replacement for the foreign material. Much as the refiner wishes to prepare such a product, economic considerations have so far prevented it and there seems little chance that it will be accomplished in the future.

The chilling and expression which yield petroleum wax also provide an amorphous material of higher molecular weight called petrolatum. In the refined unguent form it is better known as Vaseline. This product is available in a variety of melting points and degrees of refinement ranging from 110° F. to 160° F. and in color from dark reddish brown to white. The rubber compounder uses it as a softener where permanent softness is desired, as a tack producer in tape dopes, etc., and to some extent in general softening of molded mechanicals. It has been generally suitable in the form in which it is utilized by other industries and rubber processing has made no special grades necessary. Its cost varies with the degree of refinement and melting point and present levels will probably prevail since we can foresee no refinery changes which will seriously increase or curtail the amount which is currently available.

In his attempt to prepare higher melting point waxes, the refiner has removed all the oil from petrolatum, securing an amorphous wax whose melting point ranges from 140° F. to 180° F. These waxes have been variously called petroleum ceresin, micro-crystalline wax, etc. Chemically they are higher in molecular weight than crystalline wax and generally behave similarly in rubber. They bloom less than a crystalline wax and give more flexibility. All these waxes are now higher in price than crystalline wax. There is a distinct possibility that as production increases this price will be lowered, but at present there is no oversupply and the price level continues.

Most of the wax now goes to paper, waterproofing, etc., with rubber consumption quite small compared with the total. Rubber will benefit through extended use by other industries but present trends in rubber application do not presage any great application which will require increased production. These waxes are the only material which the refiner offered when faced with the montan problem. As mentioned earlier, they have not proven satisfactory as a replacement except in a limited way, largely due to their lack of similarity chemically to the foreign material.

Oxidized asphalt or mineral rubber is the only other petroleum derivative used in large amount in rubber. Interest in it usually varies directly with the price of rubber, the higher the price of rubber, the more interest in mineral rubber. It is a standard component in battery box formulae and in the mechanical goods portion of rubber production where an inexpensive extender is necessary. Block flooring is an excellent example, at the same time pointing out one of the limitations to its use—its color. Mineral rubber is always black, a prohibitive quality when preparing compositions pigmented with pastel or other light colored materials. One refiner has prepared lighter colored products and others have given the problem experimental consideration.

In other respects the present commercial grades are adequate and in the realm of color only can we foresee any possibility of future improvement. To what extent the color can be improved will be determined by the price the materials can command. They will be competing with the light colored coumarone resins from coal tar, and somewhere between the prevailing price of these and the present mineral rubber cost is the price which will tell the refiner how much processing and to how much segregation trouble he can go to lighten the color. Solvent extraction may provide here also the answer to rubber needs although it has yet to be applied on any major scale.

Future of Petroleum and Rubber

Looking at the future of petroleum and rubber in summary it seems unlikely there will be major changes in the chemical nature of petroleum rubber solvents though present boiling ranges may be abbreviated if processing advantages justify the added cost. New refining processes have already made available a whole range of aromatic type naphthas of solvency comparable with the higher boiling coal tar materials but they have not been widely adopted in rubber manufacture. This limited use means either that higher solvency is not the answer to the proofing problem or that the economics of the aromatic type naphthas is limiting them.

Solvent extraction applied to light and heavy lubricating fractions of petroleum provides a new group of materials which should find wider use in many phases of rubber compounding, particularly as the more refractory synthetic rubbers attain wide use. Mineral rubber may be made lighter in color but the extent to which this is feasible is in doubt.

As petroleum becomes more and more a hydrocarbon raw material for synthetic rubbers, there should be a better mutual understanding of it in all rubber processing. This may yield many new petroleum rubber applications which cannot be foreseen based on our knowledge of past and present utilization.

X-Ray Studies of Rubber

Part II — A Resume of Past Experimental Observations

By GEORGE L. CLARK

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The following article supplements the discussion in the February, 1941, issue of "Rubber Age" on the fundamentals involved in the x-ray study of rubber. It completes the groundwork required for an understanding of the articles on compounded rubber which are to follow. These articles are appearing in "The Vanderbilt News," and we are indebted to the R. T. Vanderbilt Company for permission to publish them.

IN Part I of this series of discussions *(1)* the attempt was made to present in broad terms the basic principles of x-ray science as it applies to the disclosure of the ultimate structure of rubber. It was shown how a crystal, by virtue of its three-dimensional lattice-work architecture diffracts x-rays just as a ruled grating diffracts white light and produces a rainbow or spectrum of color. Thus a so-called diffraction pattern may be measured and interpreted in terms of the building plan of the crystal with the aid of the Bragg law: $n\lambda = 2d \sin \theta$ (where n is an integer, λ is the x-ray wavelength, d the spacing between a given set of parallel planes in the crystal, and θ is the corresponding angle of incidence).

It was Katz, working at the University of Amsterdam, who in 1925 first published a report that stretched rubber acts like any crystalline material in producing a fiber diffraction pattern, from which much could be derived concerning the nature of rubber. In the fifteen years since this discovery many notable contributions have been made in extending with x-ray methods our knowledge of rubber as an elastic highly polymerized hydrocarbon. The names Katz, Mark, Meyer, Hauser, Gehman, Field, von Susich, Hauk, Iguchi, Schossberger, and several others are familiar generally to the rubber industry as scientists who have utilized this comparatively new research method to determine the fundamental molecular structure of rubber, or the nature of elasticity, and the practical effects of compounding and of various types of physical, mechanical, or chemical treatment.

A few of these effects have been illustrated in Part I with typical patterns. Let us review some of these earlier x-ray findings briefly before proceeding to the new results to be reported later in this series.

Earlier X-ray Findings

1. Ordinary crude rubber, such as crepe or smoked sheet, in the unstretched condition gives a pattern typical of any liquid or glass—a broad halo with no evidence of sharp rings or spots (Fig. 10 of Part I). This simply means that the rubber molecules are in the same condition of random disorder to be found in any true liquid, even though the rubber is solid in the sense that it retains its form.

2. When, however, strips of crude rubber are stretched to above 75 to 100% elongation at room temperature, the crystal fiber pattern of symmetrical spots makes its first appearance superposed on the "liquid" or "amorphous" halo. As elongation increases, the crystal interferences remain in exactly the same positions and sharpness but increase in intensity, as a higher and higher percentage of the material of the specimen becomes organized and "crystalline" at the expense of the unorganized fraction *(2)*.

Finally with "racked" rubber at several thousand percent elongation the pattern is so preponderantly crystalline that it is similar to that of a pure crystallized organic compound. Highly stretched rubber is probably about 80% crystalline. Thus rubber, of all natural or synthetic materials, is unique in that it runs

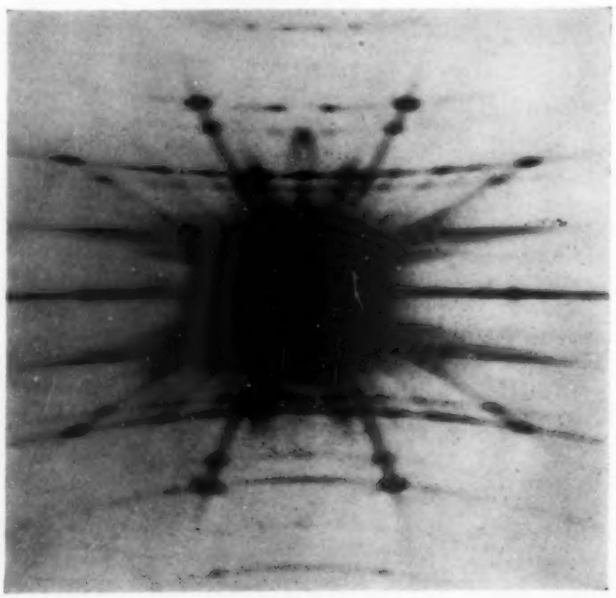

FIG. 1—X-ray pattern of asbestos fiber.

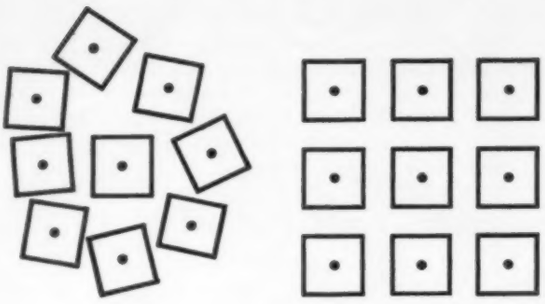

FIG. 2—Cross-section of bundle of fibers. (a) Preferred orientation in one direction (perpendicular to page), random orientation in two directions. (b) Orientation in all three directions.

the gamut between completely amorphous and completely crystalline states. It constitutes the standard, according to Mark, with which all other less versatile materials may be calibrated.

3. When crude rubber is separated into ether-insoluble and ether-soluble fractions, each fraction gives the same amorphous halo in the unstretched state as whole rubber, but there was observed in the writer's laboratory on patterns of the ether-insoluble or gel rubber, a ring very close to the center, corresponding to a very large interplanar spacing of 54 A.U. which could not be detected either for whole rubber or for the ether-soluble or sol fraction. This would seem to indicate a larger molecule or a more complex organization in the gel phase.

Gel rubber is more difficult to stretch than whole rubber and shows far less evidence at a given elongation of an uncrystallized or amorphous fraction, but it nevertheless gives a fiber diffraction pattern like that of whole rubber. Sol rubber on stretching acts like milled whole rubber in that a fiber pattern may not appear even at 1000% elongation, at room temperature, provided that no oxidation takes place. Gehman has shown, however, that if petroleum ether instead of ethyl ether is used as solvent, the sol fraction also produces a normal fiber pattern on stretching.

4. Milled rubber at room temperature or above gives only the amorphous halo pattern, not only when unstretched *but also when stretched*: even when stretched far beyond the point when organization of molecules normally would take place.

5. Rubber vulcanized by any method, unstretched, gives the same amorphous pattern as crude rubber, unstretched.

6. Vulcanized rubber of every description thus far observed gives the same crystal fiber pattern as crude rubber does when stretched above a certain elongation, usually 150 to 250% depending upon the composition and cure of the sample. There is no direct evidence of the presence of the vulcanizing agent or of any change in molecular spacing caused by the introduction of the agent. Thus vulcanization due to the formation of new cross linkages between molecules has restored the ability of the molecules, lost by milling, to align themselves on a lattice plan upon stretching.

7. The usual pattern for rubber in the stretched state is typical of a real fiber, for example, asbestos (Fig. 1). This pattern is made up of many crystal grains or "crystallites" all lined up parallel with the axis of the fiber. Suppose for a moment that we picture these "crystallites" as short pieces of a lead pencil with a square cross section. Then in the fiber all these pieces would be arranged with the "leads" all parallel to a common direction or fiber axis; but in this bundle, each little pencil can be turned any way whatever *around* the lead as an axis so long as the lead remains parallel to the others.

In other words there is preferred orientation with respect to one axis, and random orientation with respect to the other two axes. Such is the arrangement of the ordered regions in stretched rubber, as illustrated in Fig. 2. We know that this is true, for if an x-ray pattern is made with the beam passing parallel to the direction of stretching, instead of perpendicular as is the usual case (Fig. 3 of Part I), we find that it consists of continuous rings indicative of random or "*powder*" orientation (Fig. 3) instead of sharp spots. This type of texture is always given by the usual dumb-bell specimen of rubber in which the cross sectional area decreases considerably upon stretching.

If, however, a rather broad specimen is stretched so that the decrease in gauge is greater than the decrease in width, then we find true orientation in *all* directions, and a fiber pattern is obtained no matter what the direction of the x-ray beam. It is this three-dimensional technique which gives the evidence required for establishing the picture of the ultimate crystal unit of stretched rubber.

8. Elevation of temperature always opposes the establishment of ordered regions on stretching, and for each elongation there is a temperature (maximum 90°C.) above which the x-ray pattern becomes amorphous. Thus "crystallized rubber" has a "melting" curve as shown some years ago by von Susich. Similarly stretched rubber in a solvent liquid or vapor, such as benzene, swells, and the crystal pattern disappears. Also Hauser has shown that crude rubber stretched to produce a strong fiber pattern, and then vulcanized while stretched, loses its ordered state and produces an amorphous pattern.

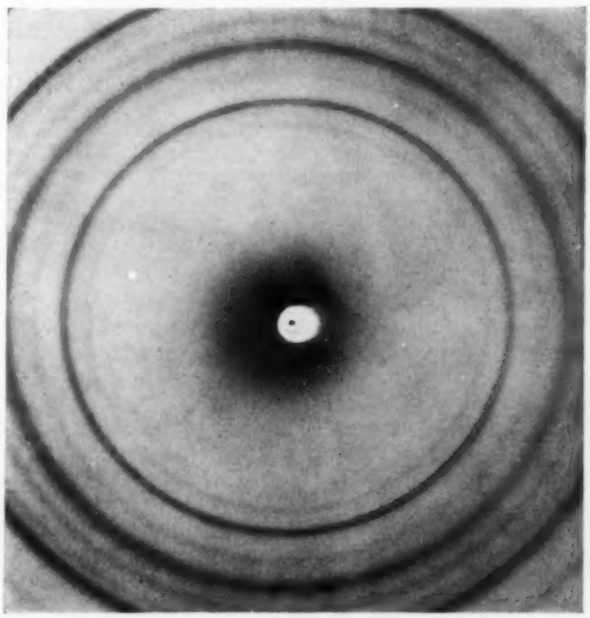

FIG. 3—X-ray pattern of unstretched, frozen rubber.

9. Conversely, unstretched rubber, either crude or vulcanized, kept at low temperatures (+10° to −40°C. depending on the specimen) will truly crystallize in small randomly oriented "crystallites" just like the grains of a crystal powder and produce an x-ray pattern consisting of continuous sharp rings (Fig. 3) with exactly the same radii as the distance of the various spots from the center on the usual fiber pattern. These crystals melt at 6° to 16°C., although values up to 43.5°C. have been reported for samples frozen many years, and the sharp rings give way to the amorphous halo. This low temperature crystallization of unstretched rubber has been noted several times in x-ray work especially in the author's laboratory, and has been confirmed in beautiful dilatometer measurements by Bekkedahl and Wood at the National Bureau of Standards *(3)*. Gel and sol rubber actually crystallized at low temperatures from solutions at the National Bureau of Standards both give the same pattern of rings as the whole rubber frozen in bulk.

10. Carbon black and other fillers do not change the fundamental structure or behavior of the rubber matrix but they do affect the elongation necessary to produce the first evidences of crystal fiber interferences, and of course greatly affect properties. The fiber pattern may appear at 150%, for example, after addition of carbon black, instead of at 250% for the vulcanized rubber without filler. Gehman and Field *(4)* have made a very thorough x-ray study of rubber-carbon black mixtures and found that the elongations necessary for appearance of the fiber diagram are in the same order as the average particle sizes of the blacks which impart regions of enhanced stress in the vicinity of each particle. The effects of other fillers upon the rubber, and of stretching on the fillers themselves, will be the subject of Part IV in this series.

11. Once established by stretching, the ordered or crystalline portion of rubber tends to persist when tension on the specimen is released and the rubber retracts. Thus Clark, Kabler, Blaker, and Ball *(5)* established from x-ray patterns of two commercial rubber compounds the complete crystallization hysteresis loops which are quite analogous to the usual stress-strain hysteresis loops. It is self-evident that the characteristics of this crystallization loop will depend very sensitively upon the composition and history of the compounded rubber. Similarly this behavior may be correlated with the physical and mechanical properties of a given compound. The above mentioned authors, for example, established a direct correlation between the crystallization hysteresis loops and resiliency. Field established a direct connection between the degree of crystallinity of a given rubber vulcanizate and creep, extensibility and ultimate strength.

Measurements Made During X-ray Analysis

To conclude this resumé of many though not all of the contributions of x-ray science to rubber science to date we may summarize the specific measurements which may be established with the aid of x-ray diffraction patterns for any given specimen of rubber:

1. The percentage elongation at which the first evidence of crystallization appears
2. The calibrated intensity of one or more diffraction interferences as a function of each step of elongation up to a maximum value arbitrarily set or established by the ultimate elongation at break; thus giving comparisons of crystallization intensities up to a maximum of 500 or 600% elongation.
3. The same for each strip on retraction to the point of disappearance of the fiber spots (which is almost invariably below the point for first appearance); thus giving the size and shape of the hysteresis loop and the energy corresponding to the enclosed area.
4. The proportion of crystalline to amorphous phases at each elongation on extension and retraction, by measurement of relative intensities of fiber spot to amorphous halo.
5. All above measurements for a given specimen when different factors are varied, such as rates of loading, number of cycles of extension and retraction, times of relaxation, temperatures, thicknesses of specimens, and periods of aging.
6. The temperatures above which "melting" (or disappearance of the pattern), and below which "freezing" or crystallization of the unstretched specimen occur.

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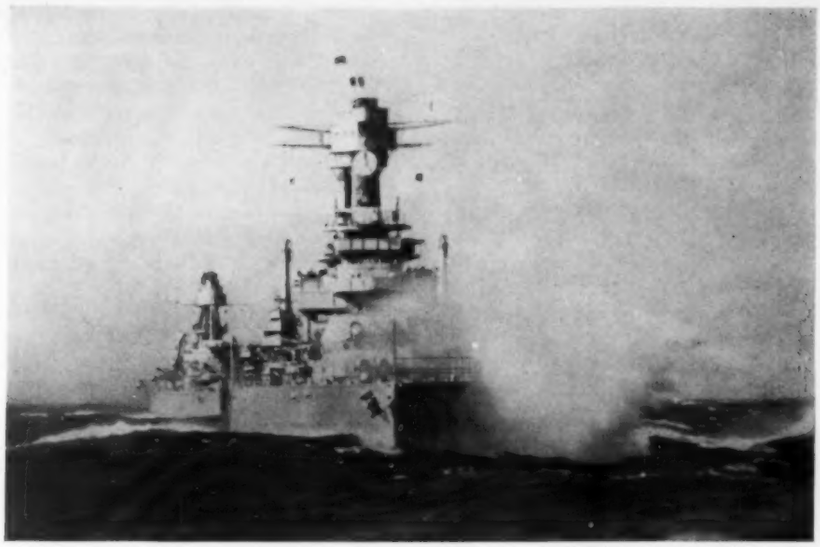
(1) *Rubber Age (N. Y.)*, Vol. 48, p. 321 (1941).
(2) Field, *J. Applied Physics*, Vol. 12, p. 23 (1941), has recently measured these proportions of crystalline and amorphous components in stretched rubber in a major contribution among x-ray papers on rubber.
(3) *Ind. Eng. Chem.*, Vol. 33, p. 381 (1941).
(4) *Ibid*, Vol. 32, p. 1401 (1940).
(5) *Ibid*, Vol. 32, p. 1474 (1940).

Stitching Rubber to Metal

MACHINES which drive wire stitches through steel sixty one-thousandths of an inch thick, at a machine speed of 295 per minute, are included among the hundreds of stitching machine models featured by Bostitch, Inc., of East Greenwich, R. I. Some of these models have been adapted to the stitching or fastening of rubber to metal. Among companies using these machines are those stitching rubber gaskets to metal refrigerator tops, rubber to automobile fenders for anti-squeak insulation, and sponge rubber to clutch housings or splash pans.

Although some of the machines made by the company have been used for stitching certain light metals for years, steel stitching is a comparatively new development. The limitations and possibilities of these applications cannot yet be clearly defined. For instance, it is impossible at present to determine exactly how much thickness can be stitched without actual tests on the material. Cold rolled steel sheets of .060 to .070 inches thickness have been stitched successfully and dead soft metal has been stitched up to .116.

Several varieties of standard equipment are available to handle material of different shapes, and special adaptations can be made to meet unusual requirements. Special advantages offered by the method include the fact that no holes have to be drilled or punched, no time is spent in lining up holes and locating them on machines, and no time is needed for inserting fastening devices.



Official U. S. Navy Photographs

Use of Rubber by the United States Navy

By A. N. WECKSLER

The dependence of modern armies on rubber was discussed by the author in our January, 1941, issue. The Navy, too, needs rubber products of all types and kinds for efficient operation, and in this article Mr. Wecksler makes mention of dozens of these products and stresses the importance of rubber to a two-ocean Navy.—The Editor.

THROUGHOUT the extensive network of Naval ships and bases, rubber is playing a vital part in the nation's first line of defense. From the traditional "sou'wester," the rubber rain hat of the sea, to a hard rubber bearing which seals the propeller shaft of smaller vessels from ocean water, the floating Naval fortresses of men and steel require the use of rubber in various forms. While the tonnage consumption is not large in comparison with the Army requirements, there are numerous specialty uses in the Navy that make rubber, natural or synthetic, indispensable to the ocean battlewagons.

Although the popular concept of the Navy centers around ships, it is nevertheless true that a great part of Naval organization is represented by the shore stations which are maintained to service the ships. When the two-ocean fleet, now in the building, is finally completed, there will be roughly a half million men in the service, and a considerable number will be stationed on shore. Their needs will include land transportation, which, in turn, means tires both for trucks and automobiles.

Each major Naval base is in itself a sizeable community, requiring rubber in much the same manner as a town would, and in addition to the Naval bases in this country, there are self-contained land fortresses in island possessions. As a further illustration of the extent of Naval land operation, the service maintains its own clothing factory in Brooklyn, N. Y., where uniforms and clothes of all types are manufactured.

The Navy's bases are being added to through the leasing of bases on British islands in the Atlantic, and the outfitting of these new bases will require a multitude of rubber products; wires of communication, radio, the specially shielded dynamos used where salt air and sea spray might affect their operation.

In addition, the land stations maintain extensive medical treatment facilities, which make use of all the most modern surgical appliances and equipment, rubber naturally playing its part. Ships, in like fashion, are equipped with complete medical and surgical units, capable of major surgical treatment as well as the routine ailments of men at sea.

Essentially, however, the use of rubber by the Navy centers about the insulating properties and shock absorbing qualities of rubber. Ships that ply through heavy seas, and are of metal throughout, such as are the battleships of the Navy, require insulation of the most reliable type. Electric sockets must be of rubber, and so fabricated that under no circumstances could water seep into an electrical connection to create a short circuit.

Dynamos used by the Navy must be shielded to an extent far beyond general commercial practice, and batteries must be similarly protected. Each type of vessel presents its own peculiar problem. In submarines, the water deck above the battery storage chamber is of rubber, and the batteries themselves stand as high as the average man, weighing in the neighborhood of a ton. Such batteries, designed especially for use on submersible craft, are heavily insulated throughout.

Every type of opening or joint on a vessel, regardless of size and type, must have its gasket, usually of rubber. Hatches, including every doorway or porthole, are protected by a type of rubber gasket. This use of rubber in the Navy is extended even to mines, which are laid in fields to intercept enemy vessels navigating in forbidden waters. Such mines are inspected, and although no rubber is used in the mechanism, the hand holds on the plates which lift off the mine to make inspection possible, are made of rubber.

The Navy mines differ from Army mines in that there is no rubber insulated wire leading to the mine so that it can be made to explode from a central point. The Army mines are exploded from the shore, but the mines laid by the Navy explode on contact with another object.

All ships of the Navy have a complete telephone communication system, and in addition to the insulated connecting wires needed for this, there are naturally the hard rubber phones and earpieces. In like fashion, the ships are equipped with radio transmission and reception facilities, and utilize all of the rubber parts normally incidental to radio operation. In addition to the insulation uses aboard ships, there are such general uses for rubber as black rubber hose to wash down the ships, and the regulation fire hose, which is a requirement aboard all Naval vessels.

As previously mentioned, the Navy still uses the "sou'wester" rain hat, which took its name from the heavy southwestern gales so widely mentioned in song and legend of the old sailing days. In addition to this article of clothing, the Navy issues a rubber raincoat and rubber boots to the sailors.

Possibly the most picturesque of the Navy's rubber garments and equipment is the diving suit, which has a rubber body covering the torso and legs. This garment is a combination of rubber and canvas, combining water repellent qualities and the suppleness of rubber with the canvas carcass. The joint which fastens the head of the diving suit to the body is of metal, so that the joint can be "lashed." Rubber is required for the air tubing needed in diving, and often a telephone communication system, also requiring rubber, is maintained between immersed divers and the ship from which they are operating. The shoes used by the divers are of metal to provide sufficient weight, but the gloves are of fabricated materials employing rubber for waterproofing.

Another type of specialty clothing used by the Navy is the fire-fighting suit of asbestos. Even in this asbestos garment, rubber is used. Rubber pads are included in the helmet to make the headgear more comfortable.

Over the side in a diving suit. The suits used have rubber bodies covering torso and legs.

Vessels are Self-Contained Units

It is the combined element of living requirements and comfort aboard ship which entails the use of rubber in one form or another on Naval vessels. Actually, a vessel of war is a compact, self-contained unit, housing as many as 1,500 men. In contrast to land concentrations, a ship must be so stocked and provisioned with the necessities of life that it can be operated over an extended period of time without restocking or refueling.

From rubber aprons used in the ship's galley to sports equipment requiring the use of rubber, the ordinary day-to-day requirements on a vessel are much like the pattern of rubber consumption of a small city or town. Moreover, in addition to insulating and general consumption uses, rubber plays its part in the Navy during actual combat. In the light guns, rubber is used to absorb the shock of recoil. While such use has not been found practical for the larger gun mounts on a ship, the smaller guns can use rubber to advantage as an auxiliary shock and recoil absorbing material.

Engine mountings of rubber are important in limiting vibration, and the hard rubber bearings mentioned as used in smaller vessels are particularly important today, when small speedy boats have been found to be of strategic value for patrol duty, convoy service, and in actual battle. The bearing is for the stern tube, fitting around the propeller shaft, where the shaft protrudes from the hull. They make a water tight joint to prevent leakage of sea water past the shaft into the hull.

Of strategic importance to the Navy is its air arm, and in this field the modern war plane of amphibian type utilizes rubber to as great an extent as Army planes. While the landing gear for water surfaces consists of metal pontoons, the land gear is the same as that of an Army plane. The amphibians use the conventional airplane tires. Planes designed to operate from plane carriers have specially designed landing gear, which too require use of rubber tires.

As in the case of Army planes, the planes of the Navy require rubber in many phases of their assembly and construction. Shock absorbing devices, special mountings, use in motor assembly, sponge rubber for earphones, de-icing boots, and the many other ways in which modern warplanes make use of rubber products, are all represented in the Navy plane. Self-sealing, bullet-proof gasoline tanks are installed on all the Navy's new planes.

Moreover, the Navy requires fleets of non-rigid

balloons, and these balloons are manufactured largely of rubber. While there is no indication of how many balloons of this type may be acquired by the Navy, several have been purchased recently, indicating the value of these craft to the nation's sea defense arm.

The expansion of the naval forces is creating an additional large demand for all types of equipment, a fact which can be illustrated by the sizeable purchases recently made of rubber clothing for the increased number of enlisted men. While such items of warfare as the gas mask are usually associated with either Army or civilian needs, it is nonetheless true that such equipment is also required by the Navy.

Use of synthetic rubber in the Navy is favored in cases where the required supplies come in constant contact with ocean water or with oils. Recent specifications on some items permit the use of either natural or synthetic rubber. While specifications of long standing generally call for a particular type of natural rubber, the more recent specifications may read: "Shall be made of a high-grade natural rubber or synthetic rubber, free from pitting or imperfections of all kinds."

The Navy relies in great part upon the recommendations of the industry as to its use of rubber manufactures, and has shown its readiness to experiment with new developments of the rubber industry. However, the Navy Department adheres to a rigid practice of inspection, and requires that articles of rubber, whether of natural or synthetic rubber, be inspected at the point of manufacture. In this procedure, the Navy differs from other Government departments, which inspect purchases at the point of delivery rather than the point of manufacture.

Standards Used by the U. S. Navy

The standards used by the Navy in determining the quality of rubber products are set up by the general Federal Specifications for rubber goods, which set forth methods of physical tests and chemical analyses. While the Navy has prepared its own specifications for many of the items purchased, the Navy specifications, in most instances, refer to particular standards set up by the general specifications.

The overall specification prescribes standard physical tests for thickness, width, circumference, diameter, tensile strength, ultimate elongation, tensile stress, set and strength of lap, as well as tests for friction, abrasion, hardness, steam, boiling water, solvent immersion, hydrostatic, accelerated aging, phenol resistance, sterilization, water absorption, resistance to light.

Chemical tests are outlined to determine specific gravity, total extract, acetone extract, unsaponifiable acetone extract, waxy hydrocarbons, mineral oil, chloroform extract, alcoholic potash extract, free sulfur, net combined sulfur, sulfur in fillers, free carbon, glue, fibrous material and fillers.

Details of all these tests can be obtained by applying to the Superintendent of Documents, Washington, D. C., for Federal Specification ZZ-R-601a, inclosing 15 cents in payment. Navy specifications can be obtained from the Bureau of Supplies and Accounts, Navy Department, Washington, D. C. These specifications cover virtually all of the items purchased by the Navy, with the exception of specialties developed by the industry, and considered too much of a war secret to be published in specification form.

All windows, doors, hatches and instruments in ships of the United States Navy are shielded from sea water by rubber gaskets.

In cases where the items are of general manufacture, the Navy's practice is to invite bids from manufacturers, revealing in detail its design and specifications. Naturally, this is not possible where such information might be of use to some hostile nation, and in such cases the Navy negotiates for the supply of vital materials.

In all of its dealings with industry, the Navy has maintained a cooperative attitude, and depends largely upon commercial organizations to solve its problems of materials and supplies. In answer to a number of queries regarding what the Navy uses or is doing, the Navy officers often suggest contacting a particular individual in the rubber industry "who knows all about it".

This suggestion is not made in a spirit of evasiveness, as the Navy officers are quick to admit that industry generally and especially the rubber industry has been a primary source of advice and of inventive design in properly outfitting the warships of the sea and the land bases for the United States Navy.

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Editorials . . . . . .

Problem of Shipping

ALTHOUGH there were many factors in the past thirty days which normally would have seriously affected the price of spot and futures rubber on the Commodity Exchange and in the outside market, including the successful English campaign in Africa, the invasion of Yugoslavia and Greece by Germany, and renewed threats of Japanese aggression in the Far East, the market rose and fell on one basic factor—shipping. The question of whether sufficient bottoms will be available to continue to bring rubber from the Middle East at the same high rate of recent months is one with which both producers and consumers are now wrestling.

Statistics from Singapore and other shipping centers make it evident that rubber is piling up on docks and in warehouses awaiting bottoms. The seriousness of the situation can be realized from the fact that the Dutch have scheduled sixty per cent of all available shipping space for rubber and tin during April. Priority has also been extended to shipments of several other products from the Netherlands East Indies, including bauxite and manganese ore. Such priorities are intended to relieve shipping problems from the N.E.I., but are there enough bottoms to carry rubber, tin, ore, etc., to make the percentages allotted add up to appreciable figures?

Appreciating the problem in its entirety, the Rubber Reserve Company, in conjunction with the American Maritime Commission, is known to be working out some possible solution. One plan, which may be put into effect in May, calls for an allocation system of all available space on American ships. Space would be allotted to manufacturers and importers on a prearranged basis, with sufficient room provided for the Rubber Reserve's needs. Another plan covers the purchase or requisition of intercoastal and coastwise fleets.

Whatever the plan, it will have to be put into execution shortly if the tight condition is to be overcome. At present, bottoms are available for approximately 130,000 tons a month, of which about 115,000 tons are in American ships. If the British and Dutch vessels are withdrawn from the rubber run, as expected, then only 115,000 tons will be brought to the United States monthly. Since the Rubber Reserve Company requires approximately 25,000 tons monthly for its own needs in accumulating an emergency stockpile, this would leave only 90,000 tons a month for military and commercial production. This amount, under present conditions, is far too close to the borderline for comfort.

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New Synthetic Rubber Plan

WHEN the Reconstruction Finance Corporation first began to function on the problem of crude supplies for the domestic rubber industry, Jesse Jones, its administrator, made known the fact that the government heartily favored the construction of stand-by synthetic rubber plants to forestall any possibility of shortage caused by curtailing or cutting off of shipments of crude rubber from the Middle East. Later it became known that Mr. Jones had "cooled" on the proposition and had "pigeonholed" the plans drawn up at the time. Now, apparently, the plan, or a similar one, involving cooperation from the chemical and petroleum companies, is up again for consideration, and this time has a reasonable chance of being put into effect, according to reports filtering through the trade. It will be most interesting to learn what form and shape the new plan will take and in what manner "cooperation" will be accomplished.

CURRENT NEWS OF THE MONTH

AMERICAN TOY FAIR FEATURES SEVERAL NEW RUBBER PRODUCTS

New rubber products were very much in evidence at the 1941 American Toy Fair held in New York City from March 10 to 29, both at the Hotel McAlpin and the Fifth Avenue Building. It was estimated that approximately 1,000 buyers visited the Fair to inspect the 450-odd exhibits.

Molded Latex Products, Inc., successors to the manufacturing operations of the Kaysam Corporation, exhibited several new Kaysam toys, including a wooly lamb, a pony, a diving-shooting submarine, chicks, etc. Several of these are available in attractive sets to retail at $1.00, three items to the set.

Toyad Corporation showed its "Foamflex" rubber toys, new items including cocker spaniels, roly polys, sitting cats, bathing boys and girls, and military dolls, including a soldier, sailor, pilot and nurse. The military dolls are also sold 4 to a set packed in a gift box to retail at $1.00. Toyad toys are made under the Firestone latex foam patents.

Auburn Rubber Corp. featured its cleverly packaged sets of rubber toys, the characters being noiseless, washable and unbreakable. New sets included battleships, wheels, color guards, convoys, farm animals and defense. Several new single items were also shown, such as dreadnaughts, freighters, racers, hammers and military characters.

Several Balloon Exhibits

Balloons of all kinds and description were found in the exhibits of the Lee-Tex Rubber Products Co. and the Anderson Rubber Co. Patriotic motifs were especially in evidence. New Anderson items included the Black Tom toss-up balloon, heart-shaped balloons and a card with 3 soldier balloons. Cackling chickens and new type odd-shaped squawkers were among new Lee-Tex items.

Seiberling Latex Products Co. showed new latex infant toys, new sculptured bounce balls, and new "Baldy" and "Sno-Ball" dolls. The diversified line of Walt Disney characters featured by this company was also on exhibit. Educational play balls, another new item, were also seen.

Barr Rubber Products Co. showed its varied line of play balls, many of which are now cellophane-wrapped, as well as a new line of large size dog toys, including a rubber dumbell. Also new was a line of inexpensive dolls, including a Raggedy Ann. The extensive line of balloons featured by this company was also displayed. This included the Noisy Rascal, a novel toy, a squeeze on the body of which produces a loud, shrill noise.

Sun Rubber Co. exhibited several new 25c numbers, including a boy, girl and baby. A diaper baby, with the diaper painted on, to retail for 10c, was also introduced. Its regular lines of dolls, novelties, sets, latex toys, etc., were displayed.

Pennsylvania Rubber Co. showed its full line of play balls, featuring new designs and patterns, including the pebbly ball. Toy soccer balls were also shown. The famous Weaver scholastic play ball was exhibited by the C. B. Webb Co.

Seamless Rubber Co. displayed its extensive lines of toys, novelties and household goods. Of special interest were new latex gloves, cloth-lined gloves, and Sheerine rainwear. Handballs, beach balls and tubes, play balls and rubber horseshoes were among the playthings shown.

Other rubber products displayed were the extensive lines of balloons and novelties featured by the Eagle Rubber Co. and the Oak Rubber Co. The former showed new novelty shapes and sizes, as well as its line of play balls. Dogs, horses, elephants and other animals stuffed with kapok and covered with Pliofilm were exhibited by the Crown Toy Mfg. Co. Known as Pliotoys, these items retail from 50c to $2.00.

Novelty dolls were displayed by the Ideal Novelty & Toy Co. and the Margit Nilsen Studios. Ideal's exhibit included the Magic Skin doll, which has a head of plastic and a body of latex, as well as all-rubber dolls. Nilsen Studios featured the all-latex Deb-U-Doll, made of unbreakable Lasticoid.

Development in Soles

A new sole, consisting of a regular leather sole with a rubber rim, has been perfected by Willy Weidner, well-known shoe designer, with the assistance of the Firestone Rubber & Latex Products Co. With all the appearance of a platform sole, the new construction makes the shoe much lighter and more flexible. The edging is a fused part of the leather sole, not an extra sole thickness. The rim acts as a bumper, protecting the toe tip and keeping the shoe in better shape. Shoes incorporating the new sole are already on the market.

NEW SYNTHETIC RUBBER PLAN UNDER CONSIDERATION BY RFC

Although the proposal made last Fall for the erection of a number of synthetic rubber plants with government financing sufficient to provide the first year of the defense program with approximately 100,000 tons of synthetic rubber is known to be definitely shelved by officials of the Reconstruction Finance Corporation, it was learned last month that the RFC is working out a new plan, one which possibly calls for a joint venture shared by the government with leading members of the chemical and petroleum industries. Little is known of the new plan, other than that numerous conferences on it have been held.

According to information from Washington, the original plan was "pigeonholed" because technical difficulties, delays in obtaining equipment, and lack of sufficient skilled workers for the difficult job of manufacturing synthetic rubber, all combined to make the accomplishment of the program in either 1941 or 1942 highly improbable. The new plan, it is believed, circumvents some of these difficulties by medium of a cooperative movement.

Chemicals on License List

That a new movement was afoot was indicated by the government's action late last month in placing butadiene, acrylonitrile, chloroprene and related materials under license export control. These materials are the primary ones needed in the manufacture of such synthetics as neoprene, buna, Chemigum, Ameripol and Hycar. Government circles have heretofore displayed little concern over chemicals of this nature, but with indications that synthetics are to play an important role in the defense program, the licensing step was taken as a domestic conservation measure. Medicinal and biological chemicals were also put on the license list and others will be added shortly.

Another event of interest in the synthetic rubber situation in the past few weeks was the general preference order issued by the Priorities Director of the Office of Production Management on March 31 directing the exact allocation of approximately 1,000,000 pounds of neoprene during April among some 250 industrial users. Names of the companies to receive neoprene, or the amounts to be delivered, were not made public, but it was stated that orders for Britain were included in the allocations. Neoprene was put under mandatory priority on March 7.

A. S. T. M. Committee D-11 On Rubber Products Schedules Important New Activities As A Result Of Washington Meetings

A number of important new activities are to be undertaken by Committee D-11 on Rubber Products of the American Society for Testing Materials as a result of discussions at its meetings held during A.S.T.M. Committee Week in Washington, D. C., from March 3 to 7. The week, incidentally, was marked by more meetings of the Society's technical committees than have been held in any previous year and by the registration of over 1,000 materials engineers and testing experts. Symposiums on Particle Size Measurement and Color were special features.

Some of the projects planned by the committee on rubber, of which O. M. Hayden (DuPont) is chairman and Arthur W. Carpenter (Goodrich) is secretary, will cover requirements for synthetic jackets for insulated wire and cable, testing of material to be used for battery box containers, and stardardization of test procedures applicable to rubber products manufactured by coating fabrics such as balloon cloth, draperies, upholstery materials, etc.

Technical Committee A Active

It was decided to submit to letter ballot proposed new methods of test for automotive air brake and vacuum brake hose. Work on this subject was handled by Technical Committee A on Automotive Rubber (a joint S.A.E.-A.S.T.M. group) and has resulted in specifications which will be published by the S.A.E. The test methods will be issued by A.S.T.M.

Subcommittee II on Belting recommended that the Methods of Testing Rubber Belting (D 378—40 T) be adopted as standard, and the group in charge of specifications for products to protect persons from electric shock recommended that the specifications for rubber gloves (D 120—40) be referred for submittal to the American Standards Association for approval as an American standard.

The Subcommittee on Wire recommended that a change be made in the Table on Thickness of Insulation and Alternating Test Voltage appearing in three standards for insulated wire and cable, D 27, D 353, and D 469, to include sizes No. 16 and 18 A.w.g. for the 0 to 600 voltage classification because these sizes are not covered in the note.

The following tentative specifications are to be recommended for adoption as standard subject to letter ballot: (1) D 27—40 T—Insulated Wire and Cable: Class AO, 30 per cent Hevea Rubber Compound; (2) D 353—40 T—Insulated Wire and Cable: Performance Rubber Compound; (3) D 469—40 T—Insulated Wire and Cable: Heat-Resisting Rubber Compound; (4) D 532—39 T—Rubber Sheath Compound for Electrical Insulated Cords and Cables; (5) D 470—40 T—Methods of Testing Rubber Insulated Wire and Cable.

The program of Subcommittee VI on Packings included the presentation of the following papers: *Experiences in Packing a Cellophane Casting Machine* by William Staniar, E. I. du Pont de Nemours & Co., Inc.; *Special Gaskets* by John Boyer, E. I. du Pont de Nemours & Co., Inc.; *The Effect of Operating Variables on Performance of a Typical Centrifugal Pump Packing* by F. C. Thorn, Garlock Packing Co.; and *Tests of Packings for Refinery Services* by G. W. Oxley, Standard Oil Development Co.

The tentative revision covering buffing of samples in the Standard Methods of Sample Preparation for Physical Testing of Rubber Products (D 15—39) is to be balloted on for adoption as standard.

It is proposed to revise the Tentative Methods of Tension Testing of Vulcanized Rubber (D 412—40 T) to include in addition to the present three die shapes (1½ by 2 in., ¼ by 2 in., and ¼ by 1 in.) a new die ⅛ by 1 in. with ⅝ in. shoulders conforming to a similar die prescribed in the Federal specifications. As revised the methods are to be voted for adoption as standard.

The method for determining tear resistance of vulcanized rubber (now a proposed draft) will be revised with respect to number of nicks and permissible thickness of specimen and attention will be given to the two proposed test specimen shapes. These changes are to be completed in time for inclusion in the 1941 report at which time the method is to be submitted for publication as tentative.

Investigation of Abrasive Tests

The Subcommittee on Abrasion Tests has decided to undertake work comparing the results obtained with the DuPont and Bureau of Standards machines to determine if data obtained by one test method can be correlated or converted into the other. The subcommittee is to undertake an investigation of abrasion tests suitable for use in evaluating marine decking compounds.

A cooperative program has been arranged for comparing the results of accelerated aging tests with 80° C. bomb temperature and 70° C. Eleven laboratories are to cooperate using a number of different rubber compounds. The Tentative Method of Test for Resistance to Light Checking and Cracking of Rubber Compounds (D 518—38 T) is to be continued as tentative since changes in the type of exposure rack are contemplated.

After a great deal of discussion, it was decided to keep in essentially their present form the Proposed (draft) Methods of Accelerated Light Test Methods and Calibration of Light Sources. The committee will undertake a cooperative series of tests using different types of light sources (flaming arc, mercury vapor lamp, etc.) to develop a factual background for a standard accelerated light test.

The Tentative Method of Test for Indentation of Rubber by Means of the Pusey and Jones Plastometer (D 531—39 T) is to be recommended for adoption as standard. A progress report was submitted on hand hardness testers (durometers).

Subcommittee XVIII on Dynamic Fatigue Testing for Rubber Products considered a report of the effect of variables in rubber compounding on the results obtained in six recognized compression, flexing, and heat build-up tests on eight rubber compounds. It is expected that procedures for heat build-up testing by using compression flexing will be ready for presentation as tentative.

Additional Test Programs Planned

Subcommittee XXIII on Hard Rubber presented Proposed Methods for Asphalt Composition of Battery Box Containers. However, discussion indicated that there is a need for more complete data. Further testing will therefore be done so that in all probability the committee will not be in a position to recommend these methods until after the June meeting.

Extensive round-robin tests were conducted during the year using the physical and electrical tests from the Tentative Methods of Testing Hard Rubber Products (D 530—39 T) and much valuable data was obtained. Based on this information, a further program for revision and improvement of these methods has been developed.

New Subcommittee Appointed

A new Subcommittee on Standardizing Methods of Tests Applicable to Rubber Products Manufactured by Coating Fabrics (proofed goods such as balloon cloth, draperies, water-proofing materials, rubber blankets, upholstery materials, etc.) with Rubber and Rubber Like Materials has been authorized and is in the process of organization. A. F. Schildhauer of E. I. du Pont de Nemours & Co., Inc., is chairman of the new subcommittee. It is expected that an organization meeting will be held in June.

Frank E. Randall

Frank Ellsworth Randall, head of the company bearing his name in Waltham, Mass., and a pioneer in the manufacture of dial gauges for measuring the thickness of rubber and similar materials, as well as other precision instruments, died recently in Waltham following an operation. He was widely known in rubber manufacturing circles and was respected for his technical skill. The business is being continued by his widow.

GOVERNMENT LOSES TIRE CASE ON SUPREME COURT DECISION

In a 4 to 3 decision, the Supreme Court of the United States on March 31 denied that the Federal Government was a "person" under the terms of the Sherman Anti-Trust Act and accordingly could not collect triple damages from eighteen tire companies (including Fisk, which was involved in the original action, but which now is part of the U. S. Rubber organization) charged with submitting identical and collusive bids on the government's tire requirements. The ruling is believed a blow to the government which carried the case to the Supreme Court in the hope that it could use the triple penalty clause as a weapon against alleged collusive bidding.

Justices Roberts, Stone and Frankfurter and Chief Justice Hughes refused to construe the government as a "person" and termed such an argument "unworthy of serious consideration." Protesting against the majority decision were Justices Black, Reed and Douglas. Justice Murphy, who was attorney general at the time the government started the case in February, 1939, did not participate in the decision.

Excerpts of Contrasting Views

These excerpts illustrate the contrasting views:

Majority—"We are of the opinion that the text of the act, taken in its natural and ordinary sense, makes against the extension of the term 'person' to include the United States, and that the usual aids to construction, taken together, instead of inducing the contrary conclusion, go to support the view that Congress did not use the word in the sense for which the government contends."

Minority—"In this case, nothing in the Sherman Act itself and nothing in its legislative history makes necessary the conclusion that Congress intended to withhold from the United States a remedy given to all other purchasers."

The Supreme Court's construction of the Sherman law was based upon interpretation of two sections. In Section 7, it is said that "any person" who shall be injured in his business or property "by any other person or corporation" may sue and shall recover "threefold the damages" sustained. Section 8 construes the words "person or persons" to include corporations and associations. In the present case, the government, appealing from the Second Circuit Court, insisted that it qualified as a "juristic person."

The case was the first of its kind in history and grew out of an effort by the Government to collect damages aggregating $1,053,474 from 18 rubber companies which were said to have held up the price of tires in 1936-38 by submitting identical bids and forcing the Government to go into the open market for its purchases.

Justice Department officials had looked upon the action against the rubber companies as of considerable importance in connection with the national defense program purchases. In instituting suit the Government pointed out that its purchases amounted to more than $860,000,000 annually and it was to be expected that this figure would be greatly enlarged by the defense program.

While the court refused the government an opportunity to sue for triple damages, the Roberts decision did not preclude an ordinary suit for damages under which the government, it is assumed, now will seek to recover $351,158 which it says it lost through the allegedly collusive bids. This suit has never been brought to trial, pending settlement of the question whether suit might be brought for three times that amount, or $1,053,474.

The tire manufacturers involved in the suit, which was originally filed in the Federal District Court for the Southern District of New York, were: Cooper, Dayton, Dunlop, Falls, Firestone, Fisk, General, Goodrich, Goodyear, Kelly-Springfield, Lee, Mohawk, Norwalk, Pennsylvania, Schenuit, Seiberling, U. S. Rubber and U. S. Tire Dealers Co.

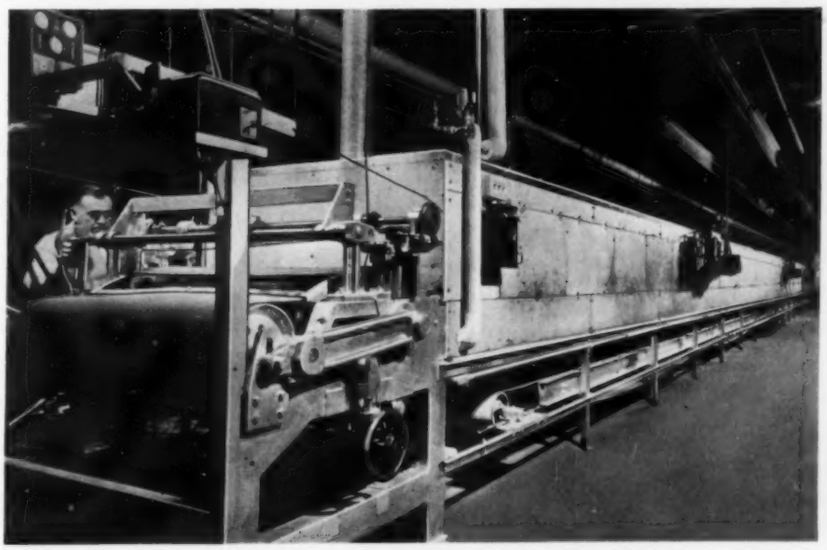
A few days after the decision of the Supreme Court, Martin E. Mandel, who described himself as a citizen of the United States, filed suit in Federal Court in New York City against these same manufacturers for $702,316, plus $2,000 for each of three causes of action and a "reasonable allowance" for counsel fees.

Mr. Mandel, suing for "himself and the United States," based his suit under an Act of Congress, passed in 1863, designed to protect the government from excessive charges due to mutual understandings among manufacturers and dealers. He believes the government was overcharged $351,158 for tires from October 1, 1936, to March 31, 1938, and brought the suit to recover twice that amount.

Scrap Rubber Institute Meets

A meeting of the Scrap Rubber Institute of the National Association of Waste Material Dealers, Inc., was held at the Hotel Sherman in Chicago on March 19, in conjunction with the annual meeting of the Association. A guest at the meeting was W. L. Finger, assistant secretary of the Rubber Manufacturers Association, currently associated with the Office of Production Management at Washington, D. C., who talked informally on questions of interest to the Institute. A resolution was unanimously passed pledging the cooperation of the Institute to the government in the carrying out of the defense program. A committee was appointed to cooperate if and when efforts were made by Washington to stabilize scrap rubber prices. At the annual election, Julius Muehlstein, of H. Muehlstein & Co., was elected president of the Institute, and Alex Schulman, of the company bearing his name, vice-president.

UNIT FOR SELF-SEALING FUEL TANK LININGS SPEEDS DEFENSE OUTPUT



The processing machine depicted above, which is 120 feet in length, changes rubber from raw material to finished product in one continuous process. It is being used to speed up production of self-sealing fuel tank linings for national defense orders of the government. The unit is so long that a dual control communication amplifying system must be used between the two ends. The unit, the first of its kind used in the rubber industry, was developed and is being used by the Firestone Tire & Rubber Company at Akron. (EDITOR'S NOTE: Because this unit is being used in defense work, no further description of it may be published at this time).

NEW YORK RUBBER GROUP HOLDS ITS SPRING MEETING

Approximately 200 members and guests attended the Spring meeting of the New York Group, Rubber Division, A.C.S., held at the Building Trades Club, in New York City, on Friday, March 21. Addresses on the crude rubber situation were delivered by E. G. Holt, Chief of the Leather & Rubber Division of the Bureau of Foreign & Domestic Commerce, and A. L. Viles, president of the Rubber Manufacturers Association. A talk and demonstration on "Electrocoating" was given by J. O. Amstuz, chief engineer of the Behr-Manning Corp. A movie, "Goodyear Shoulders Arms," was shown after dinner through the courtesy of the Goodyear Tire & Rubber Co.

Mr. Amstuz, the first speaker, described the "electrocoating" process, which consists essentially of passing an adhesively treated backing sheet simultaneously through an electrostatic field and over particles of rayon, wool, cotton, etc., making liberal use of charts and slides to illustrate the process. He then showed some colored motion pictures, further clarifying the process to his audience, and ended up by giving a visual demonstration of it through the use of special equipment. Norson fabrics, made by the process, were on display. (Editor's Note: Some interesting data on the "electrocoating" process by Mr. Amstuz appears elsewhere in this issue).

The second speaker was Mr. Holt. Taking as his subject "The Crude Rubber Situation," Mr. Holt reviewed the consumption of crude, reclaimed and synthetic rubber in the United States last year and then pointed out that it was imperative that we continue to depend on the Middle East for our supply of rubber, since we could not expect any appreciable amounts from Latin American countries for many years to come and the question as to how soon synthetic rubber plants could be constructed to turn out sufficient production to meet this country's annual demand is still problematical. On the subject of synthetic rubber the speaker enumerated several arguments for and against immediate expanded capacity.

Pointing out that the stock situation in the United States was considerably improved last year, Mr. Holt said that even better improvement could have been shown if a larger percentage of reclaim was used by rubber manufacturers. He also said that if crude rubber supplies should be cut off it might be necessary to extend the practice of retreading tires and to institute regulations reducing the speed of automobiles so that tires would last longer. Rubber for luxury items, too, might have to be curtailed.

Mr. Viles, who in addition to his duties with the R.M.A. is also Chairman of the Purchasing Committee of the Rubber Reserve Company and a member of the Priority Committee on Rubber of the O.P.M., gave an informal talk and at its conclusion answered questions from the audience. He made mention of the two stockpile agreements already negotiated with the International Rubber Regulation Committee by the Rubber Reserve Company and revealed that a third one had been prepared and was under consideration by the I.R.R.C.

On the question of synthetic rubber, Mr. Viles took the stand that rather than being competitive items, crude and synthetic were allied items and predicted that the time would come when blends of the two materials would be the order of the day. He pointed out that crude rubber producers are well aware of the synthetic rubber situation and could maintain their position by bringing the price down if necessary. In this connection he made mention of the fact that greater yields per acre are now being achieved and still greater ones are expected in the future. He indicated, however, that plans are now under consideration by government authorities to increase the domestic output of synthetic rubber.

Coming Events

May 1. Joint Meeting, Buffalo and Canadian Rubber Groups, General Brock Hotel, Niagara Falls, Ontario, Canada.

May 2. Chicago Rubber Group, Chicago. Symposium on Synthetic Rubber.

May 6. Los Angeles Rubber Group, Hotel Mayfair, Los Angeles, Cal.

May 9. Detroit Rubber & Plastics Group, Hotel Whittier, Detroit. Symposium on Adhesives.

June 16-20. Semi-annual Meeting, A.S.M.E., Kansas City, Mo.

June 23-27. A.S.T.M. Annual Meeting, Palmer House, Chicago, Ill.

Sept. 8-12. American Chemical Society, 102nd Meeting, Atlantic City, N. J.

Boston Group Hears Tuttle

Dr. John B. Tuttle, of the Standard Oil Co. of New Jersey, was the principal speaker at a meeting of the Boston Group, Rubber Division, A.C.S., held at the University Club in Boston on March 28. Discussing "Petroleum Products in Rubber," Dr. Tuttle dealt with the advantages and disadvantages of petroleum solvents, plasticizers and reclaiming oils. Entertainment at the meeting was furnished by Bertram Adams, master magician, whose "Demonstration of Psychological Deceptions for Agile Minds" had the audience completely baffled. A sound color film, "Persia Faces Today," was also shown, through the courtesy of the Colonial Beacon Oil Co. Approximately 175 members and guests were in attendance. (Editor's Note: Dr. Tuttle's paper is reproduced elsewhere in this issue).

WINKELMANN AND YORAN HEAD CHICAGO RUBBER GROUP

At a special meeting of the Chicago Group, Rubber Division, A.C.S., held at the Eitel Field Building Restaurant in Chicago on March 14, Dr. H. A. Winkelmann, of the Dryden Rubber Co., was elected chairman, and Dr. Calvin Yoran, of the Featheredge Rubber Co., vice-chairman for the ensuing year. B. W. Lewis, of Wishnick-Tumpeer, Inc., was re-elected secretary-treasurer. In addition, the following were elected to the Executive Committee: Dr. C. E. Frick (Van Cleef Bros.), J. Kirschner (Dryden Rubber), Charles Leiter (Inland Rubber), O. J. Urech (Sam'l Bingham's Son), and L. J. D. Healy, consulting chemist.

The speaker for the evening was Arnold Smith of the Monsanto Chemical Co., who spoke on "The Manufacture of Rubber Products in Europe Today." Mr. Smith, who has spent much time in Europe in recent years, gave a very educational talk and brought forth many technical and economic questions pertaining not only to the rubber industry but to affiliated industries as well. He pointed out that while Europe was ahead of the United States in the production of sundries and toys, it was one to two years behind this country in the manufacture of volume goods, such as tires.

Canadian Group Hears Lazier

M. J. C. Lazier, associate professor of applied mechanics, University of Toronto, was the principal speaker at the meeting of the Ontario Rubber Section of the Canadian Chemical Association, held at McMaster University in Hamilton, Ontario, on March 27.

Taking as his subject, "Why Airplanes Are Like That," Mr. Lazier outlined the development of the airplane since the days of the Wright Brothers and discussed both light and heavy aircraft. He went into the different phases of design, structure, materials and manufacturing methods.

At the business session Dr. Norman Grace (Dunlop) and Thomas Batty (Firestone) were re-elected chairman and secretary-treasurer, respectively. J. Ramsay (Gutta Percha & Rubber), R. M. Ferguson (St. Lawrence Chemical) and J. C. Howard (Kaufman Rubber) were elected members of the Program Committee.

The next meeting of the group will be held jointly with the Buffalo Rubber Group at the General Brock Hotel in Niagara Falls, Canada, on Thursday, May 1.

Some material describing the precautions which should be taken when inflating truck tires on rims which employ locking rings has been prepared by the Rubber Manufacturers Association for free distribution upon request. The Association maintains headquarters at 444 Madison Ave., New York City.

ASME RUBBER SUBDIVISION PLANNING 1941 PROGRAMS

The Subdivision on Rubber and Plastics, Process Industries Division, American Society of Mechanical Engineers, of which Felix L. Yerzley of the Rubber Chemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, is chairman, is planning programs for the Fall meeting of the parent society, to be held in Louisville, Kentucky, from October 13 to 15, and the annual meeting, to be held in New York City early in December.

According to Chairman Yerzley, the subdivision is not planning to hold a regular meeting at the Louisville meeting, but papers on rubber and plastics have been requested and two such papers will be presented if they are secured. One paper has been definitely scheduled, and there is opportunity for another. Four papers are planned for presentation at the New York meeting, and suggestions relative to the program at that meeting are invited by the chairman.

Communications regarding papers should be sent to Dr. J. F. D. Smith, vice-chairman of the subdivision, who can be reached at the Research Division, United Shoe Machinery Corp., Beverly, Mass. Dr. Smith is in charge of the technical programs of the subdivision. He should be advised of intentions to present papers at least four months prior to the date of scheduled meetings.

Dr. G. M. Kline, Chief of the Plastics Section of the National Bureau of Standards, Washington, D. C., is secretary of the subdivision. In addition to the three officers named, the following are members of the subdivision's executive committee: L. E. Jermy, W. F. Bartoe, S. H. Hahn, R. A. North and W. A. Zinzow.

PERU PLANNING PROGRAM AS IMPORTANT RUBBER PRODUCER

If plans now under consideration fully materialize, Peru will become one of the most important producers of crude rubber in South America. From present activities it seems certain that Peru will join with Brazil, Colombia, Ecuador, Bolivia and other nations as a permanent source of rubber supply in the Western Hemisphere.

Already, according to reports from Lima, a rubber plantation at Oramina, abandoned about 20 years ago, is being rehabilitated by Peruvian officials with the help of experts from the United States. The plantation will be used to test rubber production under commercial conditions and to train Peruvians in plantation operation.

An experimental station at Tingo Maria has been opened and natives are being sent under expert supervision into stands of wild rubber to gain experience in tapping the trees. The country has thousands of rubber trees in forests near the Amazon.

Seeds and clones are now being exchanged by Peru with experimental stations located in other Latin American countries. Tests are being made at the Oramina plantation to develop a high-yielding, disease-resistant tree at varying altitudes. Trees on the lowest ground are said to be most subject to disease.

New White Reinforcing Filler

Witcarb, a new white reinforcing filler, has been announced by Wishnick-Tumpeer, Inc., 295 Madison Avenue, New York City. The new filler is a finely divided, untreated, technically pure precipitated calcium carbonate which is said to offer special advantages in rubber formulas requiring high tensile and modulus and tear resistance. Witcarb has a specific gravity of 2.680, particle size (microns) of 2-3, and a controlled pH of 9.0.

Standard Adds New Mica Account

Standard Chemical Co., Akron, Ohio, was recently appointed general sales agents in the rubber industry for the Richmond Mica Corporation of Biltmore, North Carolina, manufacturers of the "Silversheen" and "Diamondsheen" brands of mica.

ADEQUATE RUBBER SUPPLY SEEN IN REPORT MADE TO CONGRESS

Assurance that an abundant supply of crude rubber was available in South America was made in a report given to Congress by Earl R. Bressman, an expert of the Department of Agriculture, on April 2. The report described the progress of investigations made in Latin American countries, made possible by an appropriation of $500,000, and stated that 15 countries were being surveyed to determine their potential rubber output.

Regarding sufficient production in South America to meet the growing demands of the United States, Mr. Bressman declared "I can say that there can be produced in this hemisphere our requirements possibly 50 times over." He pointed out that Hevea or para rubber can be grown on the east coast of Central America, as well as in the Amazon basin. Leaf disease, he said, was still a technical problem.

Turning to the question of guayule, Mr. Bressman said that the price factor made it impossible for the guayule plant to compete directly with rubber produced from the Hevea plant. He said the price of rubber would have to be between 25 and 30 cents to make it feasible to grow plants like guayule on an extensive scale.

U. S. RUBBER OPENS SPECIAL DEFENSE EXHIBIT TO EDUCATE EMPLOYEES

The United States Rubber Company has opened a defense exhibit in its building at 1230 Sixth Avenue, New York City, to educate and train employees so that they may better serve the government and industrial firms interested in the manufacture of defense products. Included in the exhibit are the life preservers, life-saving suit and diver's suit seen in the upper right photograph. In the lower left photograph, vice-presidents Herbert E. Smith and L. D. Tompkins, both members of the company's defense committee, are inspecting portable airplane fuel hose, also included in the defense exhibit.

NEWS IN BRIEF

The creation of a new commissariat for the rubber industry to carry on a campaign for domestic production of rubber in Russia was ordered on March 29 by the Soviet Supreme Council at Moscow. Tikhon Borisovich Mitrokhin was appointed commissar.

The New York office of the General Latex & Chemical Corporation, formerly called the Vultex Chemical Co., has been moved from 125 Duane Street to 47 West 34th Street. The new phone number is WIsconsin 7-5713. Dr. George D. Kratz continues in charge of the office.

U. S. Rubber is sponsoring a new national organization to be known as the Star Drivers Club, the object of which is to promote safety on the highways of America through more careful truck driving. Special recognition will be given to truck drivers who compile unusually good safety records.

Dayton Rubber Mfg. Co. has opened bids for the construction of its new plant which will be built near Waynesville, N. C., at a cost of approximately $100,000. The new plant will manufacture specialty products for the textile industry among other items.

Rai-Seal, a new rubber compound of the hot-poured type that is said to seal the expansion and contraction joints during all movement of concrete slabs, will be used for the more than 165,000 square yards of concrete runways in the new Toledo, Ohio, airport, which will be completed this spring. Rai-Seal is a product of Rubber Associates, Inc., of New York City.

A huge hydraulic press, with a pressure of 1,000 tons per square inch, the largest ever manufactured by L. Albert & Son, of Trenton and Akron, in the 50 years of its existence, has been completed. It will be used for forming high speed grinding wheels for cutting steel for gun barrels.

Goodyear is building a special type of observation balloon which can be changed from a "free" balloon to the equivalent of a motorized airship within seven minutes. These balloons, known as C-6 models, are being made for the U. S. Army.

Naugatuck Aromatics Division of the U. S. Rubber Co. has acquired the assets and good will of the Riviera Products Company of Chicago. The division maintains headquarters at 12 East 22nd Street, New York City.

The Flextite Corporation, manufacturers of adhesives and dispersions, has moved to new quarters at 407 S. Dearborn St., Chicago. A research and development laboratory, under the supervision of Stanley W. Campbell, has been installed.

U. S. Rubber has changed the name of its latex foam sponge from U. S. Royal Foam to Koyalon. The new name better covers the increasingly diversified uses to which the material is being put. An expanded advertising and consumer education program is planned for the spring and summer.

Seiberling has adopted a new dull, satin finish for all of its tires. Known as Velvet Tire Paint, the new finish is said to be superior to the glossy finish formerly used because it resists scuff marks, does not collect dust as readily, and is easier to wipe clean. The paint is also being offered to recappers and used tire dealers.

Atlas Powder Co., Wilmington, Delaware, has purchased the business and assets of the Keratol Co., of Newark, N. J., manufacturer of artificial leather. The business will be continued under the name of the Zapon-Keratol Division of Atlas Powder Co.

Goodrich has made a change in its famous trademark. The familiar wreath enclosed "G", flanked by two diamonds, has been changed to a small wreath enclosing a "B.F.G." The new trademark is already appearing on the company's advertising, promotion, etc.

Widespread installation of underground conveyor belts, moving at speeds as high as 450 feet per minute, is enabling mine operators throughout the country to double and triple volume deliveries of coal at mine mouths, eliminate accidents, and reduce delays by almost 100%, according to Carel Robinson, noted consulting engineer and advocate of mechanized coal mining, of Charleston, West Virginia.

A wage increase ranging from 3 to 5 cents an hour for production and engineering employees has been announced by the Kelly-Springfield Tire Co., Cumberland, Maryland. A general increase of 10% for 2,500 to 3,000 employees working for hourly wages has been granted by the Firestone Rubber & Latex Products Co., Fall River, Mass. A seven-day work week in the gas mask manufacturing division of the latter company has been instituted.

Air Defense Role of Rubber

The prominent part being played by rubber in the national defense program was dramatized over the air waves on Saturday, April 5, in a program broadcast by the National Broadcasting Company which was sponsored by the National Association of Manufacturers. Listeners were "taken" behind the scenes in Akron factories where such defense items as bullet-proof fuel tanks and tires, aircraft de-icers, tank tracks, gas masks, and other products are being made. A feature of the program was a broadcast by Graham MacNamee, noted announcer, from a bombing plane in which he emphasized the importance of rubber parts in modern military aircraft. The broadcast was one of a series of "Defense for America" programs sponsored by the N.A.M.

1941 Standards Made Available

Publication of a new list of American Standards for 1941 has been announced by the American Standards Association, 29 West 39th St., New York City. More than 400 standards are listed, covering definitions, technical terms, specifications for metals and other materials, methods of test, dimensions, safety provisions for use of machinery, and methods of work. The list is available without cost on application.

General Atlas Carbon Co., 60 Wall St., New York City, producers of Gastex and Pelletex, has made available the "1941 Baseball Dope-Book", copies of which are available on application to the company. The book gives data on records and schedules, as well as general information on baseball.

Crews of the Army's new M-3 tanks are protected from face injuries and body bumps by a lining of 100 pounds of latex sponge with the same cushioning qualities as that used in mattresses and upholstery. Air-Cell, the name applied to the latex sponge made by Goodrich, is being used.

Railway Express Agency has equipped a number of light units of its large motor truck fleet with tires made with Ameripol. The decision for such installations was made because it was felt it would "contribute toward the creation of an industry which might prove as valuable to national security as battleships and planes."

Walter Kidde & Co., Bloomfield, N. J., has prepared a wall poster for free distribution which summarizes the outstanding "do's" and "don'ts" on the uses of fire extinguishers. There is no advertising on the poster and copies can be secured by writing the company.

NEW YORK RUBBER GROUP ANNOUNCES CONTEST RULES

The New York Group, Rubber Division, A.C.S., has announced its rules for the 1941 Prize Essay Contest. The rules are:

(1) Contestants must be under 35 years of age and be paid-up members of the New York Group.

(2) Subject Matter: Papers should be of a technical nature relating to rubber or the so-called synthetic rubbers—properties, compounding materials, practice, processing methods, technical equipment, or some such phase of rubber technology. Papers may be the result of original work, development results or interpretive results and reviews of rubber literature.

(3) All papers must be submitted in *triplicate*, with the author's name *omitted*. Attach name and address of the author separately to each copy. Each paper will be coded or otherwise numbered so that the judges cannot identify the author. All entries must be typewritten on 8½ x 11 inch paper, double spaced. In general, papers should conform in style to the form of papers published in "Industrial & Engineering Chemistry": *i.e.*, they shall contain the following essentials: Abstract; Aim or Purpose; Body of Paper; Summary; Bibliography. This form is suggested only, and need not be followed exactly to qualify.

(4) Papers submitted will become the property of the New York Group, and their publication in the trade press will be at the discretion and by selection of the Contest Committee.

(5) Prizes: The Committee will select the three papers deemed best in its judgment, and prizes totalling at least $100 will be distributed to the winners in the order of their value as decided by the Committee.

(6) All entries must be received by Thursday, September 4, 1941. They should be sent to K. J. Soule, Chairman, c/o Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J.

Printed copies of these rules, suitable for posting on bulletin boards, have been made available and copies may be secured without cost by addressing requests to B. B. Wilson, c/o *India Rubber World*, 420 Lexington Ave., New York City, secretary-treasurer.

Elect New Royle Officers

The following officers were recently elected by John Royle & Sons, manufacturers of extrusion machinery for the rubber, plastics and other industries: *President*, Clifford H. Ramsey; *Vice-President*, Justin H. Ramsey; *Treasurer*, Thomas C. Malcolm; *Secretary*, Robert H. Kelley. These officers, with the addition of Vernon E. Royle, make up the directorate of the company. Mr. Clifford H. Ramsey now owns a controlling interest in the firm.

Akron Group Elects Officers

L. V. Cooper

T. L. Stevens

The following officers were elected by the Akron Group, Rubber Division, A.C.S., at a meeting held at the Akron City Club, Akron, Ohio, on March 21: *Chairman*, L. V. Cooper (Firestone); *Vice-Chairman*, T. L. Stevens (C. P. Hall); *Secretary-Treasurer*, D. G. Benson (Goodrich). A technicolor film, "The Power Behind the Nation," was shown at the meeting through the courtesy of the Norfolk & Western Railway. The group was also entertained by the Underwriters Barber Shop Quartet.

Metal Hose Moves Headquarters

The Metal Hose & Tubing Co., Inc., of Brooklyn, N. Y., one of the world's leading manufacturers of gasoline and oil hose, is reorganizing and will shortly move its factory and general offices to a new location at Dover, N. J., approximately 40 miles from New York City. The company was founded in 1912 by John M. Oden, who successfully conducted the business until his death in February, 1938. Since then the business has been capably run by Mr. Oden's estate under the direction of certain employees. The executors of the estate have now made it possible for these employees to purchase the business, effective March 1. The new company, to be known as the Metal Hose & Tubing Co. (Delaware), will be run by an executive committee consisting of A. L. Wallace, vice-president; W. D. Magagnos, treasurer; and J. S. Thompson, sales manager.

Government Needs Technologists

The U. S. Civil Service Commission has announced an open competitive examination to secure technologists for national defense work. Difficulty is being experienced in filling positions in such branches of technology as rubber, plastics, minerals, textiles, explosives and fuels. The positions to be filled are in several grades with salaries ranging from $2,600 to $5,600 a year. Competitors will not be given a written test but will be rated upon their education and experience. Further information and application forms may be obtained from the U. S. Civil Service Commission, Washington, D. C.

LOS ANGELES GROUP HEARS CURTIS OF R. T. VANDERBILT

E. B. Curtis, sales executive of the R. T. Vanderbilt Co., New York City, and former chairman of the Rubber Division, A.C.S., was the principal speaker at the meeting of the Los Angeles Group, Rubber Division, A.C.S., held in the Rainbow Room of the Mayfair Hotel in Los Angeles on April 1. Approximately 90 members and guests were present.

Mr. Curtis spoke informally, giving a running history of the Vanderbilt concern and a brief biography of Mr. Vanderbilt. He emphasized the importance of efficiency in business, and made mention of some men who in his opinion were among the most efficient of those with whom he has had contact. Mr. Curtis was introduced by Bill Reeder, of U. S. Rubber, an old friend. A dramatic sound film, "Singing Wheels," was also presented.

The door prize, a portable radio donated by the National Standard Co., through L. O. Smith, was won by Fred Woerner (C. P. Hall), while two special prizes, consisting of a $5.00 and $10.00 merchandise certificate, respectively, donated by the R. T. Vanderbilt Co., went to Bill Haney (Kirkhill Rubber) and J. Duguid (Associated Rubber). The next meeting of the group will be held at the Mayfair Hotel on Tuesday, May 6.

R. I. Club Sees Travel Films

Approximately 105 members and guests attended a meeting of the Rhode Island Rubber Club held at the Narragansett Hotel in Providence on March 14. No papers were given, but two short sound films were exhibited through the courtesy of the Colonial Beacon Oil Co. These films were taken during the Thaw Expedition, sponsored by the Esso Marketers, which started from Paris, France, before the outbreak of hostilities, and toured the Balkan countries, as well as Persia, Arabia and other Oriental countries. John E. Marshall, Jr., president of the club, presided.

Chicago Group Plans Symposium

The Chicago Group, Rubber Division, A.C.S., will hold a Symposium on Synthetic Rubber at its next meeting, set for May 2. An exhibit of rubber products, manufactured in the Chicago area is also planned for this meeting. K. La Pointe, of Sears, Roebuck & Co., has been named chairman of the committee in charge of the exhibit. A symposium on Plastics is planned for the June meeting, as well as an exhibit by the suppliers of raw materials to the rubber industry. Exhibits planned for future meetings include fabrics, molds, machinery and testing equipment.

LOS ANGELES NEWS

Ships, not the available supply of raw material, constitutes the rubber industry's foremost problem, in the solution of which Los Angeles harbor is playing the leading role, in the opinion of John L. Collyer, president of the B. F. Goodrich Company, who addressed 100 business and civic leaders at the California Club at a luncheon given in his honor by Joseph C. Herbert, general manager of the company's plant in Los Angeles, on Tuesday, April 1. A year ago, Mr. Collyer said, 80 per cent of all the rubber shipped to America was carried in British bottoms but today because of war conditions the same percentage is being carried in American bottoms.

Mr. Collyer pointed out that 60 per cent of all the rubber used in the world is being used in America and a large portion of that is being unloaded at Los Angeles. The speaker reviewed the part played by his company in national defense and he urged that everyone in America "take off his coat and go to work for national defense".

Mr. Collyer was here for a few days inspecting the company's plant and left for San Francisco, Seattle and other coast points on Friday, April 4.

J. M. Hamilton, of the sales department, and J. W. Snyder, of the technical department, of the Binney & Smith Company, spent some time in Los Angeles in March and early April. They were guests at a dinner given at the Jonathan Club by the local Binney and Smith branch. Thirty-five were present. A sound slide film showing the uses of Micronex in rubber was shown. Among the guests were a large number of the leading rubber chemists in Los Angeles.

F. H. Banbury of Farrel-Birmingham Co. has been spending a couple of months in the Los Angeles area, living most of the time at the Mission Inn in Riverside. He was slated to leave for his home in Connecticut about April 8.

E. B. Bromhead, formerly with the Latex Seamless Products Company, is now with the engineering department of Lockheed.

Vic Vodra, local sales manager for the R. T. Vanderbilt Company, has returned from a trip which took him through the Pacific northwest area and to the home office in New York. While he missed the killing mid-west blizzard by one day he states that he did not miss sub-zero temperatures. E. B. Curtis, of the home office, returned to Los Angeles with him.

The Arrowhead Rubber Company has moved into its new modern home. Facilities are greatly increased.

T. Kirk Hill and Ed Royal spent two weeks on a tour of Mexico last month. They left Los Angeles on March 22 and returned April 6.

A conference of Goodyear executives was held at the Los Angeles plant in March. Among those attending were H. E. Blythe, vice president in charge of tire sales; D. R. MacKenroth, manager of dealer and stores division; F. W. Fox, representing the truck and tractor tire sales division; K. C. Zonsius, manager of the automobile tire sales division; and R. E. Davis, manager of sales and research.

Although the strike at the plant of the Darnell Corporation in Long Beach is still in progress (at this writing) enough men have been working to keep up production in a fair way, representatives report.

Thirty-two men are taking the course in rubber technology at the University of Southern California. The course, under the engineering defense training program of the United States Office of Education, is being given by R. B. Stringfield, Fred Woerner and Carl Stentz, all well known in the rubber industry here. Classes are held three nights in the week and the course will run sixteen weeks. It covers as thoroughly as possible in that length of time the principles of rubber technology and compounding. Inasmuch as many applicants had to be turned away the course very likely will be repeated in the fall, according to Mr. Stringfield.

A consistent campaign is being conducted at the B. F. Goodrich Company plant to make the wearing of safety shoes universal. To that end safety shoes of good quality and styling at reasonable prices are being presented at the employees' store.

New War Orders Placed

Included among recipients of recent orders placed by the U.S. Army and Navy for products and materials needed for the national defense program were the following: Republic Rubber, oil suction and discharge hose, $41,270; Goodyear, steam and water hose, $65,074; Seiberling, truck tires, $21,230; Pharis Tire, tires and tubes, $1,310; Seiberling, face blanks for gas masks, $144,000. In addition, a $4,740,000 contract for machine gun clips was awarded to Firestone.

40 CENT MINIMUM WAGE RECOMMENDED BY COMMITTEE

A 40 cent minimum wage for the rubber industry was recommended in a report filed with the Administrator of the Wage and Hour Division on March 27 by the committee for the industry which was appointed on February 25. The report was filed by Arthur T. Martin, Dean of the Law School of Ohio State University, chairman of the committee. The recommendation was voted unanimously by the committee at the closing session of its meeting in the Hotel Washington in Washington, D. C., on March 25.

In its report, the committee requested the Administrator "to give sympathetic consideration to any application received from the industry for permission to employ learners at a reasonable rate lower than 40 cents an hour" and for "a reasonable period of time." The recommendation, if approved, will raise the hourly wages of approximately 9,900 workers. The rubber industry employs approximately 132,000 workers.

A public hearing on the recommendation will be held at the Willard Hotel in Washington, D. C., on Monday, April 21, at 10:00 A.M., before Henry T. Hunt, Principal Hearings Examiner, as presiding officer. Any interested person, supporting or opposing the recommendation, may appear at the hearing to offer evidence, either in his own behalf or any other person, providing he files a notice of his intent to appear with the Administrator of the Wage and Hour Division on or before April 16.

The committee appointed to recommend minimum hourly wage rates for the rubber industry was composed of fifteen members, representing the interest of the public, employers and employees. A complete list of these members, as well as a definition of the rubber industry insofar as the wage and hour administration is concerned, appeared in the previous issue.

Footwear Inventories Low

Stocks of waterproof footwear in the hands of manufacturers at the end of 1940 are the lowest year-end inventory on record, according to a study just completed by the Rubber Manufacturers Association. They amounted to only 5,497,000 pairs, about seven weeks' supply at the average rate of shipments during 1940. At the close of 1939, the inventory was 9,724,000 pairs, 77% higher than the current figure.

Carbon Black Prices Raised

An increase in the price of carbon black, effective April 1, 1941, has been announced by all leading manufacturers of that material. The increase amounted to one-quarter of a cent, the price for carbon black, in carload lots, f.o.b. plant, now being .03175 per pound. It was .02925.

NAMES IN THE NEWS

CARROLL L. WILSON, who entered government service in 1939 as Special Assistant to the Secretary of Commerce, has been appointed Director of the Bureau of Foreign & Domestic Commerce, succeeding JAMES W. YOUNG, who recently resigned.

W. W. COWGILL, member of the defense committee created by the U. S. Rubber Co. to cooperate with government agencies, addressed the Metropolitan Rubber Division of the American Society of Mechanical Engineers on March 18. He discussed the role of rubber in modern warfare.

CLIFFORD C. SIMPSON, who has been associated with organizational work for the past eighteen years, has been appointed executive director of the National Association of Independent Tire Dealers, Inc., succeeding GEORGE J. BURGER, resigned.

CHARLES E. MCCORMACK, who has served as chief chemist of the O'Sullivan Rubber Co., at Winchester, Va., for the past seven years, has left that company to join the Neoprene Division of DuPont.

L. M. RICE has been appointed assistant sales manager of the organic chemicals department of the American Cyanamid & Chemical Corporation, New York City. He has been with the company since 1925.

J. G. SCHNITZER, well known in shoe manufacturing circles, and associated with the Bureau of Foreign & Domestic Commerce for many years, was recently appointed assistant chief of the Leather & Rubber Division. E. G. HOLT is chief of the Division.

AL BLOCK, long associated with the toy and novelty field, has been named sales manager of the Toyad Corporation, Latrobe, Penna. The company now maintains permanent display space at 200 Fifth Ave., New York City.

J. HORACE FAULL, JR., associated with the laboratories of the Firestone Tire & Rubber Co., at Akron, for the past several years, has joined the research staff of the General Latex & Chemical Corp., Cambridge, Mass.

LESTER E. PACKARD, secretary, Avon Sole Co., Avon, Mass., recently addressed the Randolph-Holbrook (Mass.) Rotary Club at Randolph on "Rubber Production and the manufacture of Rubber Goods." He exhibited photographs and samples.

CYRUS S. CHING, director of public and industrial relations, U. S. Rubber Co., is a member of the Employers Group of the recently appointed eleven-man National Defense Mediation Board, created by President Roosevelt "to assure that all work necessary for national defense shall proceed without interruption and with all possible speed."

ARTHUR R. GOW, production manager of the Seamless Rubber Co., New Haven, Conn., for the past 11 years, has been appointed vice-president and factory manager of that company, succeeding WALLACE DE LANEY who resigned to become president of the Faultless Rubber Co.

W. G. NELSON, manager of the product control division, U. S. Rubber Co., Detroit, Mich., addressed the Foremen's Club of the U. S. Rubber Reclaiming Co., at the Hotel Lenox in Buffalo, N. Y., on April 3. His subject was "The Technical Man in Industry."

New Building for Kleinert

Plans for the building of a new factory have been announced by the I. B. Kleinert Rubber Co. It will occupy an entire block on 20th Avenue, between 128th and 129th Streets, in College Point, L. I., the location of the company's present manufacturing facilities. The new building, said to be necessitated by increased demand for merchandise produced by two new divisions of the company, play shoes and corsets, as well as the rapid expansion of the shower curtain division, will comprise three floors of manufacturing space, totaling 60,000 square feet. The upper floors will be connected to the present plant by means of a bridge.

Announce Prices on Hycar

The following prices have been announced by the Hydrocarbon Chemical & Rubber Co., Akron, for Hycar O.R., the company's recently developed synthetic rubber: 1 to 25 pounds, $1.00 per pound; 26 to 99 pounds, 80c per pound; 100 pounds or more, 77c per pound. These prices are on the basis of f.o.b. Akron and terms are net cash. Special discounts, from 1 to 3%, are offered to contract customers, based on amounts purchased monthly. In a statement accompanying the announcements, the company said that Hycar O.R. is now available for general distribution and that orders are being accepted for April delivery.

T. W. MILLER RETIRES AS HEAD OF FAULTLESS RUBBER

T. W. Miller, Sr., one of the founders and later incorporators of the Faultless Rubber Co., Ashland, Ohio, and who has served as the chief executive of that

company for almost 40 years, has retired as chairman of the board and severed active connection with the company on April 1. Under his capable leadership, Faultless Rubber grew from a company originally having a capital of only $400 to one of Ashland's largest industrial concerns. The company makes rubber sundries and specialties, and enjoys a world-wide reputation for quality merchandise.

Mr. Miller's knowledge of the rubber business, his inventive ability, and his personality have won for him wide recognition in the domestic rubber industry. For a number of years he has been a member of the board of directors of the Rubber Manufacturers Association and only recently was re-elected to another three-year term. Many of the factory workers at Ashland have been employed there since the factory was started in 1903. Mr. Miller has taken an active part in Ashland's community affairs for many years, but has always avoided the limelight of publicity.

Mr. Miller will continue to participate somewhat in the affairs of Faultless Rubber, since he has retained a post on the board of directors. He will also continue as a director of the National City Bank of Cleveland, the First National Bank of Ashland, and F. E. Myers & Bro. Co. of Ashland. He has a home in St. Petersburg, Florida.

The retirement of Mr. Miller occasioned several changes in the executive personnel of Faultless Rubber. Wallace W. De Laney, who has been vice-president and factory manager of the Seamless Rubber Co. at New Haven, Conn., for a number of years, has been elected president of Faultless Rubber. C. D. Hubler, who has been president, continues as executive vice-president. T. W. Miller, Jr., who joined Faultless in 1936 and has served as vice-president continues in this post.

CANADIAN NEWS

A digest of the $268,000,000 Canadian and British government programs of capital aid to war industries recently released by Hon. C. D. Howe, minister of munitions and supply, Ottawa, shows that the Canadian rubber industry has been assisted to the extent of over $1,500,000 for the purchase of new tools and equipment necessary to produce rubber and other items.

This has been divided among nine companies as follows:

Bata Shoe Company, Frankford, Ontario, $28,050 from the Canadian government for gauges and $136,600 from the United Kingdom for mountings.

Dominion Rubber, Kitchener, Ontario, $163,469 from Canada for production of various size tires, and $67,632 from Britain for tooling to produce 10.50 x 20 sand tires.

Dunlop Tire, Toronto, $44,000 for gun firing and brake control equipment, $157,325 for 9.00 x 16 R.F. tires for military purposes, and $6,195 for new sizes of "runflat" tires and tubes from the Canadian government; and from Britain, $3,200 for tooling to produce 10.50 x 20 sand tires.

Firestone Tire, Hamilton, Ontario, $124,900 for tires, and $6,100 for special 9.25 x 16 R.F. tires and tubes from the Canadian government and $5,039 for tooling to produce 10.50 x 20 cross country tires from the British government.

B. F. Goodrich, Kitchener, Ontario, $30,109 from Canada for tires.

Goodyear, New Toronto, $592,433 for tires, and $6,000 for special 9.25 x 16 R.F. tires and tubes from the Canadian government, and $28,900 from the British government for tooling to produce 10.50 x 20 sand tires.

Gutta Percha Rubber, Toronto, $30,074 from Canada for tires.

Seiberling Rubber, Toronto, $100,025 from Canada for tires and $5,006 from Britain for tooling to produce 10.50 x 20 cross country tires.

Viceroy Rubber, Toronto, $734 from Canada for Duroc transit plugs for six inch howitzer shells.

Crude rubber imports into Canada in January amounted to 13,522,707 pounds, an increase of 19.6 per cent over the same month in 1940 when 11,305,227 pounds were imported.

Only seven contracts in excess of $5,000 were granted by the War Supply Board, Ottawa, to Canadian rubber companies during the month of February. These were, for the week ending February 7, for clothing, British Rubber Company, Montreal, $7,745, and B. F. Goodrich, $5,280. For the week ending February 14, for clothing, Tower Canadian, Toronto, $21,100 and Goodrich, $5,585; for personnel equipment, Dominion Rubber, $34,800 and Goodrich, $9,800; and for aircraft equipment, Goodyear, $8,630.

The National Trust Company of Montreal, trustee for the defunct Ames Holden Tire and Rubber Company, Kitchener, has announced serial numbers of $22,300 worth of the rubber company's 7% first mortgage bonds which will be redeemed May 1 at 105 and accrued interest. The bonds were assumed by the B. F. Goodrich Co., Ltd., at the time it acquired the Ames Holden property.

Although sales of Canada Wire and Cable Company in 1940 showed an increase of 75% over 1939 and operating profits of $2,298,480 were nearly double those of the previous year, the company's net profit for the year, amounting to $743,186, showed an increase of only $52,300 over 1939.

Income and excess profits taxes of $1,089,000 for 1940 compared with $187,000 for 1939 account for the smallness of the increase in net profits.

After payment of the regular preferred and class A and class B common dividends the company had a surplus for the year of $249,935 which, added to previous surplus, resulted in a $1,284,265 surplus being carried forward. Current assets shown in the statement total $5,210,827 and current liabilities amount to $1,387,473, leaving a working capital of $3,823,354 compared with $3,453,897 for 1939.

The annual statement of the Northern Electric Company shows a net profit of $1,156,457 for 1940 an increase of $391,945 over the previous year. Provision for income and excess profits taxes amounted to $555,000 against $150,000 in 1939. Dividends paid in 1940, at the rate of 60 cents a share, amounted to $486,000. Prior to this year no dividend had been paid by the company since 1932 with the exception of $121,500 paid in 1938.

Canadian Dunlop is in an exceptionally favorable position to handle war business, according to a statement recently sent to stockholders by James I. Simpson, president and general manager. The reason given is that a considerable proportion of this business is being built to British specifications.

"The close association with its parent organization, Dunlop Rubber Company, Ltd., England, which is supplying a major portion of tires and other products in the United Kingdom, has placed the company in a unique position to meet the urgent demands of the Canadian and British governments and at the same time extend substantial assistance to various government departments in technical and other matters pertaining to war products to be manufactured in accordance with British specifications", Mr. Simpson stated.

The annual report of the Goodyear Tire and Rubber Company of Canada, Ltd., shows that although there was a substantial increase in sales for the year 1940, there was a reduction on the average in the margin of profit with the result that, after making provision for increased taxes, the net profits were less by $260,988 than they were in 1939. The net profit is equivalent to $4.25 a share on the common stock compared with $5.25 in 1939, $7.49 in 1938, $4.14 in 1937 and $4.73 a share in 1936.

The statement shows earnings after deduction of $2,503,188 in taxes to be $1,960,039. Provision was made for depreciation amounting to $568,525, leaving a net profit of $1,391,514. This compares with a net profit of $1,652,502 for the previous year

After payment of the regular preferred and common dividends the company had a surplus for the year of $449,853 which added to previous surplus resulted in an $8,324,492 surplus being carried forward. Current assets shown in the statement total $10,385,347 and current liabilities amount to $1,138,220 leaving a working capital of $9,247,127 compared with $8,940,797 for 1939.

A particularly noticeable feature of the 1940 report is the reduction of approximately $2,300,000 in the total amount of cash and government bonds held. This money has been invested in raw materials inventories, goods in process and finished goods which show an increase of $2,401,214 in comparison with inventories at the end of 1939.

According to A. G. Partridge, president, "A substantial proportion of this increase in inventories is represented by an increase in the stock of raw rubber on hand. Inasmuch as all of the company's supply of this raw material has to be imported from the Far East, it was considered a wise policy to build up our stocks. In addition to building up its own inventory, the company has cooperated with the Canadian government and the rubber industry in securing and storing a substantial quantity of raw rubber, so as to ensure a continuity in the production of rubber articles for war requirements."

Chas. T. Wilson Co., Inc., dealers in crude rubber and latex, has moved to new quarters at 120 Wall Street in New York City.

FINANCIAL NEWS

American Wringer Company

For 1940: Net earnings of $261,225, or $2.34 a share, after providing for earnings of minority stockholders of subsidiaries. This compares with a net income of $299,481 reported for the previous year. In December the company purchased 1,000 shares of preferred stock of the Chamberlain Corp., Waterloo, Iowa, paying $5,000 in cash and the balance in four equal payments, two to be made in 1941 and two in 1942. It now owns 99½% of the stock of this subsidiary.

Dewey & Almy Chemical Co.

For 1940: Consolidated net profit of $502,751, which after dividend requirements on preferred stock but before setting aside $25,690 for additional foreign and domestic taxes assessed in 1940 against earnings of 1938 and 1939, was equal to $1.85 each on 217,397 shares of common stock. This compares with $2.66 each on 193,535 common shares for 1939. Consolidated gross sales in 1940 amounted to $5,279,401, an increase of 3.9%.

Master Tire & Rubber Co.

For 1940: Consolidated net income of $3,343, which compares with $223,867 reported for 1939 and $135,177 for 1938. Total sales in 1940 amounted to $3,416,040, a decrease of 12½% from those of the previous year. Current assets as of December 31, 1940, totalled $855,645 and current liabilities $367,020.

American Hard Rubber Co.

For 1940: Net profit of $456,457, after $61,003 loss on sales of securities, equal after preferred dividends to $4.73 a share on 65,503 shares of $50 par common stock. This compares with $386,123, or $3.12 a share, reported for the previous year

Gates Rubber Company

Year Ended Nov. 30: Net income of $882,506, which compares with the net of $1,192,327 reported for the preceding fiscal year. Net sales amounted to $14,808,649, a gain over the $13,140,628 in the preceding year.

Corduroy Rubber Co.

For 1940: Net income of $206,317, which compares with $233,232 reported for the previous year. Net sales in 1940 amounted to $2,927,960, a gain over the $2,583,596 reported for 1939.

Anaconda Wire & Cable Co.

For 1940: Net profit of $1,717,468, equal to $4.07 each on 421,981 capital shares, which compares with $648,889, or $1.54 a share, reported for 1939. Current assets as of December 31, 1940, amounted to $15,388,343 and current liabilities to $5,541,723, against $11,132,047 and $2,357,828, respectively, at the end of 1939.

Financial Briefs . . .

Monsanto Chemical Co. reports net income of $5,519,289 for 1940, based on total domestic sales of $45,607,600, an all-time high. The net was equal to $4.04 a common share in comparison with $3.81 in 1939.

St. Joseph Lead Co. made a net profit of $5,111,942 in 1940, equal to $2.61 a share, which compares with $5,292,907, or $2.70 a share, reported for the previous year. Net sales rose from $30,362,605 in 1939 to $38,507,829.

National Rubber Machinery Co., reports a net loss of $52,115 for 1940, after non-recurring charges of $46,332. A net profit of $102,231 was reported for 1939.

Columbian Carbon Co. had a net income of $3,068,799 in 1940, after Federal income taxes and other charges, including depreciation and depletion of $2,482,111, equal to $5.71 each on 537,406 shares of no-par capital stock. Net income for 1939 was $2,857,103.

American Cyanamid Co. reports a net income of $6,629,729 for 1940, equal after preferred dividends to $2.44 per common share, which compares with $5,420,748, or $2.07 a share, in the preceding year. Sales during 1940 were the highest in the company's history.

Offer Free Technical Service

In an expanded effort to aid in the prevention of occupational diseases, the Division of Industrial Hygiene of the New York State Department of Labor, with headquarters at 80 Centre Street in New York City, is offering all manufacturers located in the state free medical, engineering and chemical services. These services include conferring with plant physicians on specific problems, making engineering surveys of factories, and analyzing materials to determine their toxicity. Inquiries should be addressed to Dr. Leonard Greenburg, director of the division.

Launch Carbon Black Research

The Continental Carbon Company has expanded its central research facilities at Chicago for the fundamental investigation and improvement of carbon black. The work will be carried on under the direction of C. R. Johnson, technical director, assisted by Dr. Leonard H. Cohan. Complete equipment, including a Goodrich Flexometer and a Firestone

Dr. Leonard H. Cohan

Plastometer, is available for the program. Dr. Cohan is exceedingly well qualified to handle the fundamental carbon black research. He received his Bachelor's Degree at Johns Hopkins University in 1932 and his Doctor's Degree at the same institution in 1935. His graduate work was specialized physical chemistry in the field of sorption and later he taught physical and quantitative chemistry, also at Johns Hopkins. From 1936 to 1940 Dr. Cohan served as research chemist for the Colloid Company of Baltimore which was interested in producing a new type apparatus for emulsions and suspensions. Dr. Cohan is a member of the American Chemical Society, Phi Beta Kappa, Sigma Xi, and Phi Lambda Upsilon.

Complete New Processing Unit

Completion of a hitherto unannounced factory in Akron for the processing of products from Koroseal was revealed last month by officials of the B. F. Goodrich Co. The plant, which cost $300,000, will augment present production facilities in the treating of fabrics and the manufacture of cements and lacquers, and will initiate production of the recently announced Koroseal film for packaging materials and general industrial use. Embodying the most modern industrial design features, the plant will draw its raw materials from the Koroseal plant nearing completion in Niagara Falls, N. Y., as well as from the chemical manufacturing plants at Akron.

OBITUARIES

George H. Carnahan

George Holmes Carnahan, president and chairman of the board of the Intercontinental Rubber Co., operators of guayule plantations in the United States and Mexico and a crude rubber plantation in Sumatra, died in El Paso, Texas, on March 20, after an illness of two weeks, at the age of 62. Death was attributed to pneumonia. Mr. Carnahan had been living at Torreon, State of Coahuila, Mexico, where his company has extensive properties.

Born in Cadiz, Ohio, on March 16, 1879, Mr. Carnahan received his education in the public schools and also secured some special instruction in inorganic chemistry, geology and metallurgy. From 1896 to 1914 he was associated with various mining companies, including the Cia. Metalurgica Mexicana and Tezuitlan Copper Co., both of Mexico. During this time he spent two years in Ecuador in exploration and mine development.

In 1915 Mr. Carnahan joined the Intercontinental Rubber Company as president and held the same position with that concern's several subsidiaries, including the Continental Rubber Co. of New York, the Continental Mexican Rubber Co., Rubber Surfaces, Inc., and American Rubber Producers, Inc. In addition, at the time of his death, he was a director of the Fresnillo Co., and chairman of the board of the Penyon Syndicate. During the World War he was appointed vice-president and director of the Bayer Co., Inc., and other German-owned corporations, by the U. S. Alien Property Custodian.

A firm believer in the potentialities of guayule, Mr. Carnahan fostered the widespread growth of this shrub, not only for his own companies but for others as well. He was the inventor of an improved process for the extraction of rubber from the guayule plant. Other inventions to his credit included one for extracting nitrate from Chilean ores and several for use in paper manufacture. He was the author of several valuable contributions to the rubber literature on the cultivation of both guayule and crude rubber.

A Fellow of the American Geographical Society, he was also active in several other organizations including the Rubber Manufacturers Association, Explorers' Club, Sons of the American Revolution, and the New York Rubber Exchange. His social activities included memberships in the La Jolla Country Club of California, Lotus Club of New York, and the New York Athletic Club. He leaves a widow, two sons and a daughter.

James F. Giles

James F. Giles, one of the original incorporators and a director of the American Hard Rubber Co., died suddenly at his country home in Monroe, N. Y., on March 13, at the age of 78. He had served the company as secretary and vice-president, retiring from active service as sales manager of the hard rubber comb division in 1919.

Born in Brooklyn, N. Y., Mr. Giles first entered the rubber industry as a salesman for the India Rubber Comb Co. in 1892. At the time of the consolidation of India Rubber Comb with the Butler Hard Rubber and Goodrich Hard Rubber companies in 1898, he became one of the incorporators of the then created American Hard Rubber Co., and was named sales manager of the listed goods division of the new company.

In 1903, Mr. Giles was elected a vice-president of American Hard Rubber and in 1908 was elected a director, succeeding to the vacancy created by the death of Charles A. Hoyt. When he retired from the company in 1919 he continued to hold his directorship, maintaining an active interest in the company up to his death. Mr. Giles was a life member of Greenpoint (Brooklyn) Lodge No. 403, F. and A. M., and a member of the Brooklyn and Wool Clubs. Funeral services were held at the Fairchild Chapel in Brooklyn on March 16.

Dr. Herbert M. Freundlich

Dr. Herbert M. Freundlich, Distinguished Service Professor of Colloid Chemistry at the University of Minnesota, died in Minneapolis, Minn., of a coronary thrombosis on March 30 at the age of 60. Dr. Freundlich was the author of a number of authoritative books on chemistry and had done considerable work on rubber, especially with relation to jelutong and *ficus elastica* latex.

Born in Germany, Dr. Freundlich was educated at the University of Leipzig. After the World War he became honorary professor at the University of Berlin and associate director of the Kaiser Wilhelm Institute. He came to the United States from University College in London, where he had lectured for five years. He was named distinguished service professor at the Minnesota Graduate School in January, 1938, after lecturing at two summer school sessions.

Dr. Freundlich was elected to the Royal Society of London last year. He recently started new research projects in the field of colloid chemistry. He leaves a widow, son and two daughters.

Henderson M. Green

Henderson Montgomery Green, a vice-president and director of Raybestos-Manhattan, Inc., since its incorporation in 1929, died at his residence in Montclair, N. J., on March 10, after an illness of several months. He was 67 years old.

Mr. Green was a director of the Manhattan Rubber Manufacturing Company from December, 1914, and a vice-president from February, 1916, until the incorporation of Raybestos-Manhattan, Inc. He was also a director of the Manhattan Securities Co., which owns and operates the rubber plantations in Sumatra from which the present Manhattan Rubber Mfg. Division of Raybestos-Manhattan secures a good portion of its crude rubber.

Active in the mechanical rubber goods industry for more than 35 years, Mr. Green was particularly well known in the mining industry of both North and South America. He was a member of the Bankers Club of America and the Montclair (N.J.) Golf Club. He leaves a widow and a daughter.

Paul O. Gunkel

Paul Otto Gunkel, assistant to the president of the Jos. Stokes Rubber Co., Trenton, died in a New York City hospital on March 14 at the age of 47. He had been ill for several years. Mr. Gunkel was born in Akron. He had been associated with the Stokes concern for more than twenty years and from 1920 to 1939 had been vice-president and general manager of its plant at Welland, Ontario, Canada. He was a member of several fraternal organizations, both in Canada and the United States. Funeral services were held on March 17 with interment in Trenton. He leaves a widow, a son and a daughter.

George T. Jones

George T. Jones, an executive of the now defunct Davis-Jones Wire Co., of Phillipsdale, R. I., and previous to that associated for many years with the Collyer Insulated Wire Co. as superintendent, died recently. He was 65 years of age. Mr. Jones was one of the organizers of the Davis-Jones concern in 1922 and long served as its secretary-treasurer. He was appointed receiver of that company in 1933, the year he retired. He leaves a widow and two sons.

Paul J. Bresson

Paul J. Bresson, vice-president and organizer of the Perry Rubber Co., Massillon, Ohio, died at his home in Massillon on March 8 after a lengthy illness. He was 63 years old. Born in Mt. Eaton, Ohio, Mr. Bresson spent most of his life in Massillon. He was a member of St. Joseph's Catholic Church and the League of the Sacred Heart. Funeral services were held on March 11, with interment in St. Louis Cemetery in Louisville. Three brothers and four sisters survive.

NEW NOVELTIES and SPECIALTIES

All-Rubber Shower Shoe

A new type of all-rubber shower shoe, known in trade parlance as a shower scuff, was recently added to the extensive line of rubber and rub-

berized products manufactured by the I. B. Kleinert Rubber Co., New York City. Made of "Fleecenap" rubber fabric, the same type used in the company's popular shower curtains, the new shower shoe has a suede-like finish, is washable and durable, and comes in small, medium and large sizes, in pastel colors. Retailing at $1.75 per pair, the new shoes are said to be most practical, since unlike the ordinary type of slipper, which is usually perishable, they may be brought back to their original freshness after washing.

Sheer-O-Sheen Raincoat

Sheer-O-Sheen Raincoats, made of a new opaque, synthetic waterproof material, a development from the laboratories of the Goodyear Tire & Rubber Co., were recently marketed by Richards, Boggs & King, Chicago, Ill. The new coats fold neatly into a convenient cover of the same material. Very light and compact, they may readily be put in desk drawer, car or travelling bag, without crowding. They are smartly styled and are weighted around the bottom to prevent blowing up in windy weather. Sheer-O-Sheen Raincoats are available in black, green, yellow, red, brown and two shades of blue.

Hetzel Rubber Squids

Rubber squids for game fishing are available from Frank Hetzel, 2436 Palm Drive, Hermosa Beach, California. Type No. R1, has a ¾ x 2-inch head, and is equipped with seven transparent natural rubber feathers with black and red specks. It weighs 1¼ ounces and has an overall length of 6½ inches. No. R2 has a 1 x 1½-inch head, is blue in color, weighs 1½ ounces, is 6 inches in length, and has 8 rubber feathers. The third type available, No. R3, has a 1 x 3-inch head, is orange in color, weighs 2 ounces, is 7 inches in length, and also has 8 rubber feathers. Prices range from 75c to $1.00 each.

Rubber Mold Casting Sets

Designed for both the youngster and the hobbyist, rubber mold casting sets are being sold by Play Products, Inc., 1850 Henderson St., Chicago, Illinois. The molds produce replicas of leading comic characters, including the famous Orphan Annie, but other characters, such as a bust of George Washington and a Scotsman playing a bagpipe, are available. Various casting materials can be used in the rubber molds.

Baby's Pal Scientific Teether

A scientifically designed teether, known as Dr. Allen's Baby's Pal, which consists of three grooved blades, is being marketed by Richard G. Kreuger, Inc., 1359 Broadway, New York City. It is so constructed that it actually reaches the baby's slow-

growing back teeth, leaving the tongue free at all times. No matter how the baby grasps the teether, one end becomes a handle, one end serves as a teething aid, and the third end acts as a stop to prevent gagging. The ribbed surface of the teether gently massages the gums and is easily cleaned. The teether is made of red rubber.

"Lasticoid" Rubber Dolls

A complete change from the regulation baby or character doll is found in a new line recently introduced by the Margit Nilsen Studios, 71 Fifth Avenue, New York City. Made of

"Lasticoid," the name given to a specially developed latex-base formula by the Studios, the dolls are durable, unbreakable, washable and may be articulated to stand or sit. Complete wardrobes, which represent authentic copies of gowns, dresses, sportswear, indicative of certain periods in American history, can be furnished by the company. Dolls and mannequins currently featured include Glitter Girls, Ladies of the White House, and the Deb-u-Doll. For teachers and students of dress designing, dress making, millinery, etc., the company furnishes life-like fashion models, known as "Manikin Miniatures." These miniatures are usually mounted on wooden enameled bases, supplied with arms detachable at the shoulders, while hair styles are sculptured and painted.

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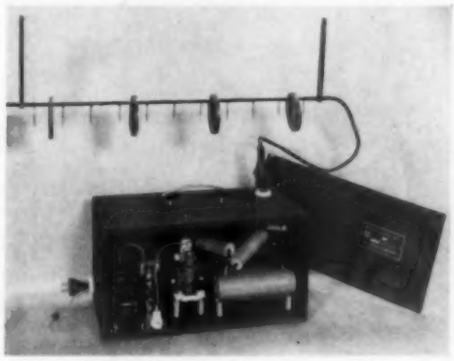
NEW EQUIPMENT

Simco Ionizer for Static Elimination

A new static eliminating device recently developed by the Simco Co., 4929 York Road, Philadelphia, Penna., shown in the accompanying illustration, consists of three transformers, a rectifying tube, and three



Simco "neutrastats" mounted in an iron box. The static bar above the power unit is a standard Simco open-type bar with fibre discs to protect the points from mechanical damage, but as a rule metal-encased static bars are used with this unit. The bar is usually provided with 15 feet of cable and is supported in such a position that the points of the bar are directed toward the material to be discharged, the distance from the points of the bar to the material being about 12 inches. Where material to be discharged moves very slowly, this distance may be increased to a few feet. The new Simco Ionizer, as the unit is called, utilizes a new method of electrically propelling static charges out into space. A static field is produced equivalent to that of 100,000 volts, or more, direct current, and only a few thousand volts are generated by the unit to accomplish this. In rubber spreading and paper coating plants, where highly volatile solvents are used, large areas in the region of the fountain of the ionizer may be kept practically free of static charges.

Cambridge Oxygen Recorder

A completely automatic oxygen recorder, which requires no chemicals for its operation and which operates from the electric supply line to provide continuous indication and graphic records of the amount of oxygen in any gas, has been developed by the Cambridge Instrument Co., Inc., Grand Central Terminal, New York City. This new machine is not to be confused with the dissolved oxygen recorder for boiler feed water systems recently introduced by the company, which was described and illustrated in the December, 1940, issue of RUBBER AGE. The standard range of the new recorder is 0 to 5% oxygen on a 10-inch scale, but the instrument can be scaled in ranges of 0 to 2% oxygen full scale and 0 to 100% oxygen full scale. Determinations by the new recorder, according to the company, are not affected by variation in the constituents of the sample gas because a differential measurement is performed. Various analyzing cells may be combined so that the instrument will provide a complete gas analysis on one chart.

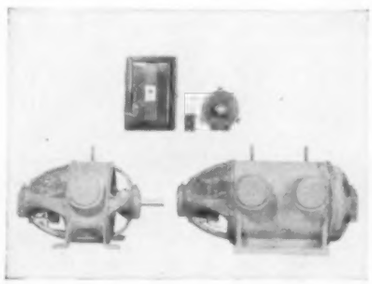
Press with Controlled Closing Speed

The F. J. Stokes Machine Co., Philadelphia, Penna., are now offering their "Standard" Semi-Automatic Presses, both of the conventional and streamlined types, with a new "slow-closing" control feature. By means of this control the final closing of the mold under com-

pression may be accurately timed for from one second to 20 minutes as may be desired. The closing speed is timed automatically and duplicated exactly in each cycle. It is said by the manufacturer that with this controlled closing action rejects can be reduced to a minimum in molding precision parts or those containing delicate inserts, and in the production of moldings with thick and thin sections. Controlling the speed during final closing is said also to permit the use of less expensive flash type molds where they would otherwise be impractical, and that savings in material, in some cases, run as high as 20%. The control mechanism makes the press automatic in operation, except for the actual loading and removal of finished pieces.

Adjustable-Speed A-C Drive

Designed especially for industrial applications requiring smoothly adjustable speeds over wide ranges with constant torque, in locations where only a-c supply is available, a new 10-to-1 adjustable-speed drive, which uses a series circuit without the usual exciter, has been



announced by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Penna. The new unit, illustrated herewith, is available in ratings from 1 to 15 h.p. with a standard speed range of from 175 to 1750 r.p.m., for two- or three-phase operation on 220,- 440- or 550-volt, 60-cycle systems. It finds application in the rubber industry in connection with tubers, for

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For Years 1935, 1936, 1937, each, Cloth, $2.00
For 1938-1939, Cloth, $4.00

LATEX IN INDUSTRY
By Royce J. Noble, Ph.D.
Text Book on Latex. Price: $7.00

LATEX AND ITS INDUSTRIAL APPLICATIONS (Vol. I)
By Frederick Marchionna
Bibliography of latex patents and literature to June, 1932. Price: $15.00

LATEX AND RUBBER DERIVATIVES AND THEIR INDUSTRIAL APPLICATIONS (Vols. II & III)
By Frederick Marchionna
Bibliography of latex patents and literature from June, 1932 to January, 1937; rubber derivatives to January, 1937. Price: $20.00
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example, where the operating requirements call for close speed control. The new drive is more flexible than the wound-rotor motor and is said to be more efficient than the conventional variable-voltage system because it has no exciter rotational losses. The five units seen in the accompanying illustration form the complete drive including control.

Improved Recording Instrument Chart

An improved recording instrument chart for continuous use has been developed by the Permochart Co., 519 Chestnut Road, Sewickley, Penna. Made of Vinylite, Permocharts, as they are called, can be con-

stantly reused, as the previous day's ink record is easily removed from the surface with a damp cloth. The new charts will not curl, are non-flammable, and are oil, gasoline and grease resistant. The chart centers are reinforced to prevent deterioration and for protection against holding devices with sharp projections. Permocharts are made for all types of recording instruments which use circular charts.

BRIEFS....

The **Research Model Taber Abraser** recently introduced by the Taber Instrument Co., North Tonawanda, N. Y., is described as an efficient and accurate testing machine for evaluating resistance of surface finishes to rubbing abrasion. Primary elements of the abraser are a motor-driven turntable on which the specimen is mounted, a counter which indicates the number of abrasion cycles, and two abrading wheels that alternately rub back and forth and at the same time criss-cross in their rolling path.

●

A new **Daily Tear-Off Device** for use on Micromax recorders has been made available by the Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Penna. It enables users of these strip-chart recorders to tear off and file a record of each day's operation. It can be quickly and easily attached.

●

A new **barrel or drum handling unit,** which lifts, moves, rotates and tilts most types of drums or barrels, has been introduced by the Falstrom Co., Passaic, N. J. Known as Barrel-Lift, it is said to combine strength with light weight for long, easy operation.

REVIEWS

BOOKS

Life, Liberty and Property. By Alfred Winslow Jones. Published by J. B. Lippincott Co., East Washington Square, Philadelphia, Penna. 5½ x 8½ in. 397 pp. $3.50.

What is the present attitude of the man in the street toward corporate wealth? Has his opinion changed in recent years due to the increasing conflicts between labor and management? Because of the growing interest in these questions the author of this book undertook a survey under the auspices of the Institute for Applied Social Analysis, the results of which are here presented. The locale of the book is Akron. The "rubber city" was selected for the survey because it has witnessed strikes, violence, sit-downs, Federal intervention, and suffered from decentralization programs instituted by the rubber manufacturers.

The book is divided into two parts, the first a history of Akron and its growth, and the second an analysis of opinions secured on specific questions asked in hundreds of interviews. In these interviews the individual was given the facts concerning seven economic situations, ranging from a threat made by an Akron rubber company to move its plant out of the city to mob action designed to prevent dispossession of a tenement family, and then was asked for his personal reactions. The replies were believed to indicate the attitude of those questioned toward corporate property as distinguished from other kinds of property. Farmers, small business men, company executives, teachers, clergymen, and members of both independent and organized unions were among those interviewed.

As might be expected the answers secured from these interviews covered the whole gamut of emotions. It is evident that the people of Akron are at odds with respect to corporate property. There was no "standardization" in the replies received, not even among workers in the rubber factories. It may also be concluded that the survey brought out the fact that there is little "class consciousness" in Akron, despite the strike troubles of the past. The results of the survey are thought-provoking, rather than conclusive.

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Proceedings of the Forty-Third Annual Meeting. (Vol. 40). Published by the American Society for Testing Materials, 260 So. Broad Street, Philadelphia, Penna. 6 x 9 in. 1396 pp. $8.50, paper; $9.00, cloth; $10.00, half-leather.

The Proceedings are now issued annually in one volume. The current volume covers the committee reports and technical papers and discussions given at the 43rd Annual Meeting of the A.S.T.M. held in Atlantic City, N. J., on June 24-28, 1940. Not only do the committee reports give full details of the important recommendations on specifications and standardized test methods for materials, but in many cases they include important data and information in the form of appended reports or papers.

There are nine reports on ferrous metals, seven on nonferrous metals, and extensive reports on other materials including rubber products and electrical insulating materials. The report of Committee D-11 on Rubber Products includes two proposed test methods, one for resistance to accelerated light aging of rubber compounds and the other for tear resistance of vulcanized rubber, in addition to a proposed method of calibrating a light source used for accelerating the deterioration of rubber. The paper on "The Standardization of Durometers," delivered at the meeting by Lewis Larrick of the B. F. Goodrich Company, is also included.

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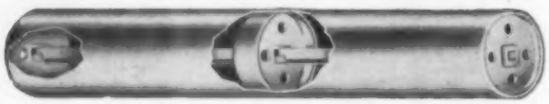

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REVIEWS (CONT'D)

1940 Supplement to A.S.T.M. Standards. (In Three Parts). Published by the American Society for Testing Materials, 260 So. Broad Street, Philadelphia, Penna. 6 x 9 in. $3.00 for any one part; $5.00 for any two parts; $7.00 for all three parts.

The A.S.T.M. Book of Standards is published triennially. In the two intervening years the Society issues supplements to each part of the book. The current supplement, issued in three parts, gives in their latest approved form 292 specifications, tests and definitions which were either issued for the first time in 1940 or revised.

Part I of the supplement is devoted to metals, Part II to non-metallic materials used for constructional purposes, and Part III to other non-metallic materials, including rubber products, electrical insulating materials, plastics, textile materials, paper, etc.

Of interest to the rubber industry are new standard methods of test for (1) accelerated aging of vulcanized rubber by the oxygen-pressure method; (2) accelerated aging of vulcanized rubber by the oven method; (3) air pressure heat test of vulcanized rubber; (4) abrasion resistance of rubber compounds; and (5) ply separation and cracking of rubber products.

•

Strategy in Selling. By J. C. Aspley. Published by the Dartnell Corporation, 4660 Ravenswood Ave., Chicago, Ill. In Seven Volumes. 4½ x 8 in. each. $6.00 complete.

These seven handy pocket-size manuals have been designed to appeal equally to the experienced salesman and the tyro who has selling ambitions. Each quotes the actual day by day experiences and strategies of some of America's top-flight salesmen. The titles of the manuals are: Planning the Sale; Getting Better Interviews; Making the Presentation; Disposing of Objections; Closing the Sale; Managing Your Time, and The Way to Leadership. The author, J. C. Aspley, a past president of the National Federation of Sales Executives, is well qualified to prepare the manuals which sales managers can use either as a sales training course for new salesmen or as the basis for a series of sales meetings to step up results from their salesmen.

BOOKLETS, CATALOGS, Etc.

Industrial Directory of New York State—1940. Published by Executive Department, Division of State Planning, State of New York, 353 Broadway, Albany, N. Y. 8 x 11 in. 916 pp. $10.00.

Compiled as a part of the Division of State Planning's inventory of the industrial resources of New York State with particular reference to national defense, this directory includes data on approximately 28,000 factories in the state and some 23,000 establishments in selected non-manufacturing industries. In the case of manufacturing plants the data given includes name and address, number of men and women employed, principal products manufactured, and chief executives. The classified section groups manufacturers by industry for the New York Metropolitan Area and Upstate; by county under each industry; and by cities of more than 25,000 population, of which there are 23.

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How Research Can Save $$ For You. General Box Co., 500 N. Dearborn St., Chicago, Ill. 8½ x 11 in.

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REVIEWS (CONT'D)

Trade-Names Index. Published by the Special Libraries Association, 31 East 10th St., New York City. 7 x 10 in. 178 pp. $4.00.

This index is composed of two parts, the first listing trade names of materials, processes and equipment of technical significance and the second giving sources for additional names indigenous to specific industries. The trade-names given, which are accompanied by brief definitions as well as a reference to the work from which the definition was secured, were taken from the files of the Technology Department of the Carnegie Library of Pittsburgh. The bibliography references were compiled by the Special Libraries Association. Unfortunately, the list is far from complete, a fact acknowledged by the compilers, but as far as it goes it should serve a useful purpose.

•

Red Oxide of Iron. Columbian Carbon Co. (Binney & Smith, Distributors), 41 East 42nd Street, New York City. 5 x 7½ in. 116 pp.

Divided into two parts, this booklet sketches the story of iron oxide pigments in general and then describes in detail the chemical composition and colloidal structure, aging behavior and reinforcing properties in rubber of the recently introduced Mapico 297 Red Oxide. An electron microscope analysis of this pigment, discussed in the booklet, indicates that it displays the same ultimate particle structure as carbon black itself, thus opening up new possibilities for its use in rubber compounding. The booklet also contains a patent summary, bibliography and index.

•

Surgical Trade Buyer's Guide—1941. Published by Surgical Business, Inc., 369 Lexington Ave., New York City. 6 x 9 in. 82 pp. Spiral Binding. $1.00.

This is a directory of sources of surgical supplies, hospital supplies and orthopedic appliances. It is divided into two sections, the first devoted to surgical and hospital supplies, and the second to the orthopedic appliances. All products are listed in alphabetical order, with names of suppliers given under each heading. The classifications are set off in bold face type, making location of any product an easy matter. Many rubber products which find application in these fields are, of course, included.

•

Hepteen Base Accelerator. (Report No. 4012-3). Naugatuck Chemical Division of U. S. Rubber Co., 1230 Sixth Ave., New York City. 7 x 10 in. 8 pp.

Recommendations for the use of Hepteen Base, an accelerator said to be twice as strong as Beutene and three times as strong as Mercaptobenzothiazole, but which processes more safely than either of them, as well as its physical and chemical properties, are given in this booklet. Several formulas are shown, including those for pure gum stock, inner tube type stock, air cured leatherette stock, and tire white side-walls. The results of physical tests on these products are included.

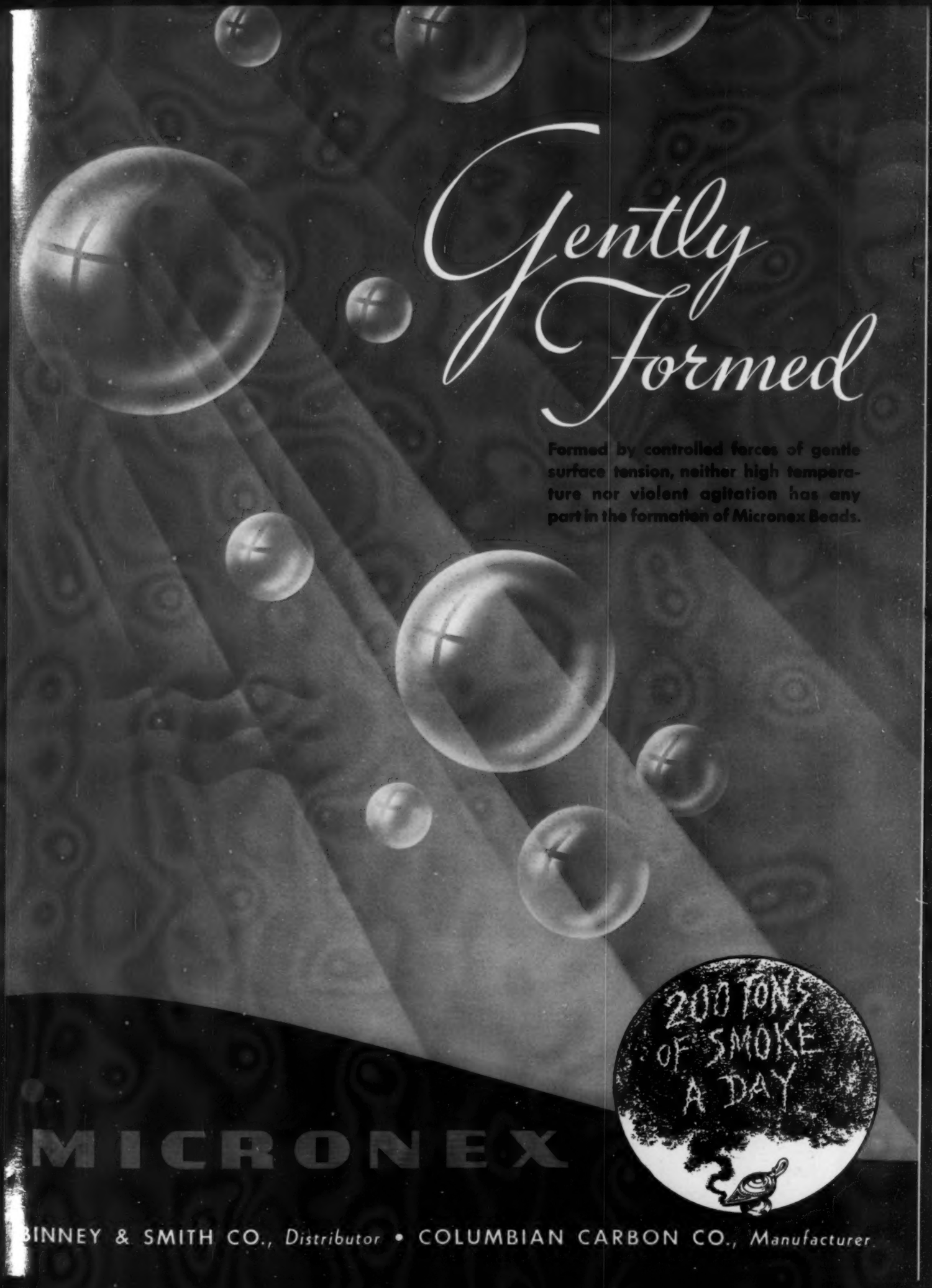
•

Fractionation of Rubber. By George F. Bloomfield and Ernest Harold Farmer. British Rubber Producers' Research Association, 19 Fenchurch St., London, E.C. 3, England. 5½ x 8½ in. 18 pp.

Reprinted from a recent issue of the *I.R.I. Transactions,* this booklet discusses a series of tests undertaken by the authors on the fractionation of rubber, particularly crepe rubber and latex rubber. The experimental method followed and the materials used are outlined and results discussed. Reference is made to previous work in this field.

•

Roller-Smith Co., Bethlehem, Penna., has issued Catalog 3630 devoted to its **Oil Circuit Breakers, Class 50-OC-75.** Complete specifications are given.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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, APRIL 9, 1941

Crude Rubber

THE primary factor affecting the price of spot rubber on the Commodity Exchange during the past month was the question of bottoms. Despite announcements from the Middle East that priority was being given to rubber and tin on bottoms available, and the report that the Rubber Reserve Company was allocating space on American bottoms and was preparing to make more ships available in conjunction with the American Mercantile Marine, there was still considerable doubt expressed as to whether enough bottoms could be made available to continue shipments at the same high rate maintained in recent months. Surprisingly, the spread of the European conflict to the Balkans had little effect on the market. During the month, prices swung in a 123 point range, starting with a low of 21.87 on March 11 and climbing to 23.00 on March 28. A general lack of interest in the actual rubber market has caused prices to weaken in the past several days, but news of a German raider in the Indian Ocean, where there are usually several rubber-toting vessels, sent the price up to 22.62 today (April 9) from the 22.12 of the previous day. Quotations in the outside market, Exchange, London and Singapore, follow:

As of April 9

Plantations—

Ribbed Smoked Sheets—

No. 1 Spot	—	@	.22½
July	—	@	.21⅞
August-September	—	@	.21⅝
No. 2	—	@	.22⅜
No. 3	—	@	.22¼
No. 4	—	@	.22⅛
Thin Latex Crepe	—	@	.23¼
Thick Latex Crepe	—	@	.23¼
Brown Crepe, No. 1	—	@	.22⅛
Brown Crepe, No. 2	—	@	.22
Amber Crepe, No. 2	—	@	.22⅛
Amber Crepe, No. 3	—	@	.22
Brown Crepe, Rolled	—	@	.21

Latex—

Normal, per lb., carload lots	—	@	.27⅝

Paras—

Up-River, fine	.24½	@	.25¾
Acre Bolivian, fine	.24½	@	.26

Balata—

Brazilian block	—	@	.13

LONDON MARKET

Standard Smoked Sheets—Buyers—April 9

April	—	@	14¼d
July-September	—	@	14¼d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—April 9

July-September	—	@	10 3/32d
October-December	—	@	9 13/32d

Scrap Rubber

Scrap rubber dealers report increased demand from the reclaimers. Prices have increased on practically all grades of scrap since our last report, primarily due to limited offerings from smaller dealers who seem inclined to hold out for higher prices. Further increases are predicted. Current quotations follow:

(Prices to Consumers)

Auto tire peelings, ton	27.00	@	28.00
Mixed auto, ton	14.50	@	16.00
Beadless tires, ton	19.00	@	20.50
Clean solid truck tires, ton	35.00	@	37.50
Boots and shoes, ton	25.00	@	27.50
Arctics, untrimmed, ton	20.00	@	22.50
Inner tubes, No. 1, lb.	.09	@	.10
Inner tubes, No. 2, lb.	.05	@	.05¼
Inner tubes, Red, lb.	.05 3/16	@	.05 5/16

Reclaimed Rubber

The high rate of interest in reclaim from practically all branches of the rubber industry noted in recent months continued last month. The Rubber Manufacturers Association estimated consumption of reclaim in February at 17,793 long tons, or 29.2% of the 61,016 tons of crude consumed. There has been no change in the price structure since our last report. Current quotations follow:

Shoe

Unwashed, lb.	.06½	@	.06¾
Washed, lb.	.10	@	.10¼

Tube

No. 2 (Compounded), lb.	.09	@	.10¼
Red Tube, lb.	.09½	@	.09¾

Tires

Black (acid process), lb.	.07	@	.07¼
Black, selected tires, lb.	.06	@	.06¼
Dark Gray, lb.	.09¼	@	.10
White, lb.	.12½	@	.14
Truck, Heavy Gravity, lb.	.05½	@	.06
Truck, Light Gravity, lb.	.07	@	.07½

Miscellaneous

Mechanical blends, lb.	.04½	@	.05

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3, lb.	.33¾	@	.34
Peeler, carded, 23/4/3, lb.	.34¾	@	.35
Peeler, carded, 15/3/3, lb.	.31¾	@	.32
Peeler, carded, 15/4/2, lb.	.31¾	@	.32
Peeler, carded, 13/3/3, lb.	.30¾	@	.31
CHAFERS			
Carded, American, 1 1/16", lb.	—	@	.34
Carded, American, 1", lb.	.26¾	@	.35

Cotton

Cotton prices swung in a 75 point range during the past month, high being 11.70 on April 3 and low 10.95 on March 17. Based on heavy consumption reports for February on several commodities, including cotton, the consumption of which set a new high record for the month, prices started moving upward in mid-March, reaching 11.14 on March 15, and then dropped off to 10.95, low for the period, on March 17 due to reports from Washington suggesting that the Administration does not concur in the idea of higher prices for commodities. Strong trade support soon brought the price back over the 11-cent mark, but legislative uncertainties held the price down. Reports of lack of favor for the Johnston cotton plan, plus news of favorable House committee action on an amendment to raise the cotton loan for the 1941 crop to 75% of parity and expectation of favorable action on the Bankhead bill to cut production and advance loans to 100% of parity, resulted in sharp advances late in March. The probability of a 12c loan sent the price up to 11.70 on April 3. War news and easiness of outside markets served to bring the price down to today's quotation of 11.40.

	Mar. 10	April 9		
	Close	High	Low	Close
May	10.73	11.16	11.05	11.16
June	10.73	11.13	11.13	11.13
October	....	11.04	10.94	11.03

Sheetings

48x40	36 in.	5.50	lb.	— @	.06¼
40x40	36 in.	6.15	lb.	— @	.05¾
40x36	36 in.	6.50	lb.	— @	.05⅝
48x48	40 in.	2.50	lb.	— @	.12
48x48	40 in.	2.85	lb.	— @	.11
56x60	40 in.	3.60	lb.	— @	.09¾
48x44	40 in.	3.75	lb.	— @	.09

Ducks

Enameling (single filling), lb.	.32	@	.34
Belting and Hose, lb.	.29	@	—
Single filling, A grade, lb.	.14	@	.14½
Double filling, lb.	.15	@	.15½

Closing Rubber Prices on New York Commodity Exchange, Inc.

"New" Standard Contract of 10 Tons

FROM MARCH 11 TO APRIL 9

Date	Spot	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Sales
Mar. 11	21.87	21.80	21.77	21.75	21.42	21.10	20.85	20.60	20.52	20.45	20.38	20.18	20.08	——	67
12	21.87	21.85	21.80	21.75	21.47	21.20	20.95	20.70	20.63	20.56	20.50	20.30	20.20	——	35
13	22.50	22.55	22.41	22.25	22.07	21.90	21.50	21.10	21.01	20.93	20.85	20.65	20.55	——	69
14	22.75	22.60	22.50	22.41	22.15	21.90	21.65	21.40	21.31	21.23	21.15	20.95	20.85	——	156
15	22.75	22.67	22.58	22.48	22.21	21.95	21.70	21.45	21.36	21.28	21.20	21.00	20.90	——	28
16															
17	22.50	22.40	22.40	22.40	22.12	21.85	21.64	21.43	21.36	21.28	21.20	21.00	20.90	——	30
18	22.12	21.80	21.80	21.80	21.65	21.50	21.25	21.00	20.96	20.93	20.90	20.80	20.70	——	45
19	22.37	22.35	22.30	22.25	22.00	21.75	21.50	21.25	21.18	21.11	21.05	20.95	20.85	——	63
20	22.50	22.52	22.47	22.43	22.19	21.95	21.72	21.49	21.40	21.32	21.24	21.14	21.04	——	97
21	22.60	22.65	22.60	22.60	22.37	22.15	21.82	21.50	21.48	21.47	21.45	21.35	21.25	——	55
22	22.60	22.55	22.50	22.45	22.22	22.00	21.75	21.50	21.45	21.40	21.35	21.25	21.15	——	10
23															
24	22.25	22.15	22.10	22.05	21.87	21.70	21.42	21.15	21.10	21.05	21.00	20.90	20.80	——	45
25	22.37	22.23	22.22	22.15	21.95	21.75	21.50	21.25	21.20	21.15	21.10	21.05	21.00	——	60
26	22.62	22.50	22.47	22.45	22.22	21.99	21.76	21.54	21.46	21.38	21.30	21.25	21.20	——	95
27	22.87	——	22.75	22.70	22.45	22.20	21.95	21.70	21.61	21.53	21.45	21.30	21.20	——	74
28	23.00	——	22.80	22.78	22.55	22.32	22.05	21.78	21.69	21.61	21.53	21.38	21.28	——	21
29	22.87	——	22.68	22.65	22.42	22.18	21.94	21.70	21.60	21.50	21.40	21.25	21.15	——	37
30															
31	22.60	——	22.55	22.52	22.10	21.95	21.73	21.52	21.42	21.33	21.23	21.08	20.98	——	65
April 1	22.30	——	22.28	22.25	21.83	21.68	21.49	21.30	21.15	21.07	21.00	20.85	20.75	20.65	56
2	22.12	——	22.06	22.06	21.63	21.48	21.27	21.06	20.95	20.87	20.80	20.70	20.60	20.50	106
3	22.25	——	22.18	22.18	21.63	21.48	21.34	21.20	21.10	21.00	20.90	20.80	20.70	20.60	83
4	22.00	——	21.90	21.90	21.30	21.15	21.02	20.90	20.80	20.70	20.60	20.50	20.40	20.30	55
5	22.25	——	22.19	22.19	21.50	21.35	21.20	21.05	20.95	20.85	20.75	20.65	20.55	20.45	10
6															
7	22.12	——	22.00	22.00	21.25	21.10	20.95	20.80	20.70	20.60	20.50	20.40	20.30	20.20	10
8	22.12	——	22.00	22.00	20.95	20.82	20.66	20.52	20.43	20.34	20.25	20.15	20.05	19.95	76
9	22.62	——	22.60	22.60	21.55	21.40	21.20	21.00	20.93	20.86	20.80	20.70	20.60	20.50	14

CHEMICAL MARKETS

New York, Apr. 10, 1941
All Prices F.O.B. Works

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.24 @	.30
A-10	lb.	.31 @	.35
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.70 @	.80
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.55 @	.60
Beutene	lb.	.70 @	.75
Butyl Zimate	lb.	— @	2.15
Captax	lb.	.50 @	.55
Crylene	lb.	.40 @	.47
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.45
El-Sixty	lb.	.50 @	.65
Ethyl Zimate	lb.	— @	2.15
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.31 @	—
Guantal	lb.	.40 @	.50
Hepteen	lb.	.35 @	.40
Hexamethylenetetramine	lb.	.33 @	—
Lead Oleate, No. 999	lb.	.13 @	—
Witco	lb.	.15 @	—
Monex	lb.	— @	2.00
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	— @	2.15
Pipsolene	lb.	1.55 @	1.80
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-2 Crystals	lb.	2.50 @	2.75
R-23	lb.	.40 @	—
RN-2	lb.	1.40 @	1.80
RN-2 Crystals	lb.	2.00 @	2.25
Rotax	lb.	.60 @	.65
Safex	lb.	1.20 @	1.30
SPDX	lb.	.70 @	.75
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.18 @	.20
Thiocarbanilide, drums	lb.	.24 @	.30
Thiurad	lb.	— @	2.00
Trimene	lb.	.55 @	.65
base	lb.	1.05 @	1.20
Triphenylguanidine	lb.	.45 @	—
Tuads	lb.	— @	2.00
Ulto	lb.	1.25 @	1.75
Ureka	lb.	.60 @	.75
Blend B	lb.	.60 @	.75
Blend C	lb.	.56 @	.65
Vulcanex	lb.	.42 @	.43
Vulcanol	lb.	.85 @	—
Zimate	lb.	— @	2.00
Inorganic			
Litharge, domestic	lb.	.07 @	.07½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Next Column)

Blues			
Prussian	lb.	.33 @	—
Ultramarine	lb.	.11 @	.16
Browns			
Mapico	lb.	.11 @	—
Umber, Turkey	lb.	.04½ @	.05
Greens			
Chrome	lb.	.21 @	.30
Guignet's Green	lb.	.70 @	—
Reds			
Antimony crimson, 15/17	lb.	— @	—
sulfur, free	lb.	— @	—
Indian	lb.	.08¾ @	—
Domestic (Maroon)	lb.	.11 @	—
Mapico	lb.	.09¼ @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red	lb.	.09¼ @	—
Whites			
Cryptone No. 19	lb.	.05¼ @	.05½
Cryptone CB No. 21	lb.	.05¼ @	.05½
Cryptone ZS-86	lb.	.07¾ @	.08
Cryptone ZS-230	lb.	.07¾ @	.08
Cryptone ZS-800	lb.	.07¾ @	.08
Lithopone:			
Albalith	lb.	.0385 @	.0410
Azolith	lb.	.0385 @	.0410
Ray-bar	lb.	.05½ @	.05¾
Ray-cal	lb.	.05¼ @	.05¾
Rayox	lb.	.13½ @	.14¼
Titanox A	lb.	.13½ @	.13¾
Titanox B	lb.	.05½ @	.05¾
Titanox C	lb.	.05¼ @	.05½
Zinc Oxide—American Process			
American Azo:			
ZZZ (lead free)	lb.	.06¼ @	.06¾
Anaconda, lead free	lb.	.06½ @	.06¾
Horsehead Lead Free Brand:			
Special—3	lb.	.06½ @	.06¾
XX Red—4	lb.	.06½ @	.06¾
XX Red—72	lb.	.06½ @	.06¾
XX Red—78	lb.	.06½ @	.06¾
XX Red—103	lb.	.06½ @	.06¾
Kadox, black label—15	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06½ @	.06¾
green label	lb.	.06½ @	.06¾
red label	lb.	.06½ @	.06¾
U. S. P.—7, bbls.	lb.	.09½ @	.09¾
Zinc Oxide—French Process:			
Florence White Seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07½ @	.07¾
Yellows			
Cadmolith	lb.	.50 @	.55
Chrome	lb.	.13½ @	.18½
Mapico	lb.	.06¾ @	—

BLACKS
(In bags, carload lots)

Aerfloted Arrow	lb.	.03175 @	—
Certified	lb.	.03175 @	—
Certified Spheron	lb.	.03175 @	—
Continental	lb.	.03175 @	—
Disperso	lb.	.03175 @	—
Dixiedensed	lb.	.03175 @	—
Dixiedensed 66	lb.	.03175 @	—
Excello	lb.	.03175 @	—
Fumonex	lb.	.03 @	—
Fumonex Beads	lb.	.03 @	—
Gastex	lb.	.03 @	—
Kosmobile	lb.	.03175 @	—
Kosmobile 66	lb.	.03175 @	—
Micronex (Amarillo)	lb.	.03175 @	—
Micronex Beads (Amarillo)	lb.	.03175 @	—
Pelletex	lb.	.03 @	—
P-33	lb.	.0475 @	—
Supreme	lb.	.03175 @	—
Thermax	lb.	.02 @	—
Wyex	lb.	.03175 @	—

COMPOUNDING MATERIALS

Aluminum Flake	ton	21.85	@24.50
Asbestine	ton	14.00	@16.00
Barium carbonate (98-100%)	ton	47.00	@49.00
Barytes	ton	22.85	@31.50
Bentonite	ton	11.00	@16.00
Blanc fixe, dry	ton	50.00	@62.50
Calcene	ton	37.50	@43.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.00	@60.00
heavy	ton	45.00	@55.00
Clay, Aerfloted, Suprex	ton	10.00	@22.00
Crown (f.o.b. plant)	ton	10.00	@ —
Dixie	ton	10.00	@22.50
Langford	ton	—	@ 7.50
McNamee	ton	10.00	@22.50
Par	ton	10.00	@22.50
Witco	ton	10.00	@ —
Cotton Flock (Dark)	lb.	.10½ @	.13
Kalite No. 1	ton	24.00	@50.00
Kalite No. 3	ton	34.00	@60.00
Kalvan	ton	95.00	@121.00
Magnesium carbonate	lb.	.06¼ @	.09¾
Mica	ton	35.00	@44.00
Mineralite	ton	—	@30.00
Pyrax A	ton	6.50	@20.00
Rottenstone (powd. Dom.)	ton	25.50	@37.50
Silene (calcium silicate)	lb.	.04 @	.045
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00	@25.00
Whiting, commercial	ton	16.00	@26.00
Columbia Filler	ton	9.00	@14.00
Witco	ton	6.00	@ —
Wood Flour	ton	24.00	@25.00

MINERAL RUBBER

285°-300° Mineral Rubber	ton	23.00	@42.00
Black Diamond	ton	25.00	@ —
Genasco, solid (factory)	ton	—	@ —
Hard Hydrocarbon	ton	23.00	@ —
Parmr, solid	ton	—	@ —
Pioneer, MR, solid	ton	—	@ —

MISCELLANEOUS

Aromatics—Rodo #0	lb.	3.50 @	4.00
Rodo #10	lb.	4.50 @	5.00
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dors	lb.	4.50 @	—
Aresklene No. 375 (dispersing, wetting and penetrating agent)	lb.	.35 @	.50
Darvan (dispersing agent)	lb.	.30 @	.39
Santomerse S (dispersing, wetting, penetrating and stabilizing agent)	lb.	.11 @	.25
Sponge Paste	lb.	— @	.18
Sunproof	lb.	.22 @	.27
Tackol (tackifier)	lb.	.085 @	.18
Tonox	lb.	.52 @	.61
Ty-Ply R (and S)	gal.	6.75 @	8.75
Unicel (blowing agent)	lb.	.50 @	—

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	2.23 @	2.48
Nitric, 36 degrees	cwt.	5.00 @	5.95
Acids, Fatty			
Laurex	lb.	.10½ @	.12¼
SL #10	lb.	.12 @	.14
Stearex Beads	lb.	.10 @	.11
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10 @	—
Alkalies			
Caustic Soda, 76%	cwt.	2.30 @	3.5
Soda Ash, 58%	cwt.	1.10 @	2.9
Oils			
Cycline Oil	gal.	.14 @	.2
Degras, bbls.	lb.	.08 @	.0
Fluxrite	lb.	.05½ @	.0
Para-Flux	gal.	.08½ @	.1
Para-Lube	lb.	.425 @	.4
Petrolatum, amber	lb.	.02¾ @	.0
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.2
Pine, steam distilled	gal.	.54 @	.59
Rosin Oil, cmpd.	gal.	.40 @	—
Rubberol	lb.	.13½ @	.14
Rubtack	lb.	.10 @	—
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	— @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.06 @	.06½
coal tar	ton	19.00	@22.00
hardwood	ton	16.00	@22.50
pine, 200 lb. gr. wt. bbl.		6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23¼
R. S. L. Resin		— @	—
Retort Pine Tar, drums	ton	20.00	@26.00
Solvents			
Acetone, pure	lb.	.06 @	.08
Benzene, 90%, tank car	gal.	.14 @	—
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.25
Carbon, bisulfide	lb.	.05 @	.08¼
Carbon tetrachloride	gal.	.66½ @	1.17
Dichlorethylene	lb.	— @	—
Dipentene, cml., drums	gal.	.38 @	.50
Ethylene dichloride	lb.	.07 @	.08
Plastogen	lb.	.07¾ @	.12
Reogen (drums)	lb.	.11½ @	.23
Rub-Sol	gal.	.09½ @	—
Trichlorethylene	lb.	.08 @	.09½
Turpentine, spirits	gal.	.44 @	.48
dest. dist., drums	gal.	.30 @	.35
Waxes			
Beeswax, white	lb.	.36½ @	.38½
Carnauba, yellow	lb.	.69 @	.70½
Ceresin, white, dom.	lb.	.11½ @	—
Montan, crude	lb.	— @	—
Paraffin (c.l.—f.o.b. N. Y.)			
Yellow crude scale, 122/124	lb.	.02¾ @	—
Refined, 123/125	lb.	.05¾ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	2.00 @	2.15
Exel	lb.	1.00 @	1.02
Gel	lb.	.57 @	.59
Hipar	lb.	.65 @	.67
Powder	lb.	.52 @	.54
Resin	lb.	.52 @	.54
Resin D	lb.	.52 @	.54
White	lb.	1.25 @	1.60
Albasan	lb.	.70 @	.75
Antox	lb.	— @	.56
B-L-E	lb.	.52 @	.61
Flectol B	lb.	.52 @	.65
Flectol H	lb.	.52 @	.65
Fleetol White	lb.	.90 @	1.15
Neozone A, B, C, D, E	lb.	.52 @	.63
Oxynone	lb.	.77 @	.90
Retardex	lb.	.45 @	.48
Santoflex B	lb.	.52 @	.65
Santovar A	lb.	1.15 @	1.40
S.C.R.	lb.	.33 @	.35
Stabilite	lb.	.52 @	.54
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.52 @	.61

MOLD LUBRICANTS

Aresklene	lb.	.35 @	.50
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Mineralite	ton	—	@30.00
Mold Paste	lb.	.12 @	.18
Rubberol	lb.	.13½ @	.14
Sericite	ton	65.00	@75.00
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.25 @	—
Amberex Type B	lb.	.18¾ @	—
Black	lb.	.08 @	.12
White	lb.	.08½ @	.13½
Brown	lb.	.08 @	.11½
Neophax A	lb.	.09 @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.07½ @	.15
Sulfur Chloride, yellow (drs.)	lb.	.035 @	.04
Sulfur, rubber makers			
Refined (bags)	cwt.	2.35 @	—
Commercial (bags)	cwt.	2.00 @	—
Telloy	lb.	1.75 @	—
Vandex	lb.	1.75 @	—

STATISTICS

Crude Rubber — Latex & Guayule — Reclaim — Tires & Tubes — Automobiles — Rims — Gasoline — Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1938	397,620	125,357,730	14.07	5,652	1,799,124	14.21	391,968
1939	469,803	167,558,245	15.92	13,125	5,832,618	19.84	456,678
1940	780,820	303,117,726	17.33	7,060	3,197,136	20.22	773,760
1940:							
Jan.	68,962	26,314,500	17.03	955	447,673	20.92	68,007
Feb.	40,603	15,578,517	17.13	1,291	599,819	20.74	39,312
Mar.	55,517	21,845,290	17.57	975	447,460	20.49	54,542
April	66,622	26,176,442	17.54	565	252,638	19.98	66,057
May	47,559	18,511,955	17.38	821	301,914	16.41	46,738
June	51,074	20,019,581	17.50	623	295,334	21.15	50,451
July	66,931	26,426,632	17.63	100	49,828	22.20	66,831
Aug.	70,453	27,608,883	17.49	416	183,369	19.69	70,037
Sept.	75,770	29,317,540	17.27	666	349,443	23.43	75,104
Oct.	73,179	27,975,598	17.07	316	123,216	17.38	72,863
Nov.	69,844	26,917,136	17.21	126	52,020	18.45	69,718
Dec.	94,172	36,369,973	17.24	205	94,422	20.52	93,967
1941:							
Jan.	84,201	33,370,482	17.69	292	138,009	21.11	83,909

Note: "Gross Imports" do not include latex or guayule. To secure more accurate figures for "Net Imports" latex and guayule figures (shown below) should be added and the re-export figure deducted from the total. Annual figures for 1924-36 were revised in February, 1937.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule: Tons	Guayule: Dollars	Balata: Tons	Balata: Dollars	Jelutong: Tons	Jelutong: Dollars	Liquid Latex (1): Tons	Liquid Latex (1): Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	3,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	...	.....	1,659	3,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1938	2,485	623,819	509	181,140	9,132	2,944,504	11,878	4,147,318
1939	2,332	463,345	694	265,553	6,640	1,603,418	27,438	10,467,552
1940	3,634	758,007	648	300,500	7,451	2,449,137	33,789	14,593,466
1940:								
Jan.	128	27,901	34	19,478	612	155,570	3,410	1,412,728
Feb.	314	70,251	55	26,420	461	134,878	2,171	947,524
Mar.	365	81,181	45	20,895	542	162,493	3,376	1,473,056
April	314	65,313	50	18,289	506	176,064	3,763	1,608,156
May	289	57,578	60	20,503	495	158,713	3,584	1,523,879
June	365	74,957	47	10,977	390	146,196	2,451	1,004,007
July	262	53,058	65	20,553	336	115,599	2,281	993,411
Aug.	297	59,464	61	22,638	701	276,642	2,278	1,022,531
Sept.	250	49,845	40	19,245	712	246,641	2,953	1,337,487
Oct.	381	77,286	70	38,092	1,150	382,168	1,156	512,153
Nov.	392	78,587	67	43,939	445	152,297	2,308	1,169,086
Dec.	278	62,586	54	39,471	1,102	341,876	3,534	1,539,957
1941:								
Jan.	447	104,128	57	32,910	698	221,911	2,184	1,019,741

(1) Weight given in pounds of dry rubber contained in latex.
Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Including Latex)

	Figures on Monthly Basis: 1934	1935	1936	1937	1938	1939	1940	1941
Jan.	39,190	46,636	48,631	50,879	31,265	47,387	54,978	64,225
Feb.	40,515	42,720	36,841	51,950	25,357	43,422	49,832	61,016
Mar.	47,003	42,153	42,813	54,129	32,389	51,416	50,192	
Apr.	44,853	44,247	52,031	51,859	29,730	45,268	50,103	
May	42,918	41,101	50,612	51,795	30,753	45,484	51,619	
June	40,147	36,156	52,772	51,860	32,540	48,438	46,506	
July	32,553	35,917	48,250	43,703	34,219	44,975	47,011	
Aug.	33,216	38,775	46,777	41,506	40,552	51,740	50,234	
Sept.	30,258	37,086	46,449	43,945	40,183	51,402	50,206	
Oct.	31,253	41,969	49,637	38,754	42,850	57,155	56,477	
Nov.	34,748	42,310	50,433	34,025	49,050	55,677	54,652	
Dec.	36,569	42,474	49,754	29,195	48,143	49,636	56,539	
Tot.	453,223	491,544	575,000	543,600	437,031	592,000	618,349	

Note: The above figures are based on the annual surveys conducted by the Leather and Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., with the exception of those for the current year which are estimates made by the Rubber Manufacturers Association. They are revised frequently and the latest available issue should always be consulted for the most reliable figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks	Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks
1931	129,690	123,000	35.1	21,714	1936	150,571	141,486	24.6	19,000
1932	75,656	77,500	23.3	16,334	1937	185,033	162,000	29.8	28,800
1933	93,587	85,000	21.2	17,780	1938	122,400	120,800	29.9	23,000
1934	108,162	100,855	22.3	20,000	1939	186,000	170,000	28.7	25,250
1935	122,948	117,523	23.9	17,000	1940	209,601	187,090	30.3	34,701
	Figures on Monthly Basis								
1940:									
Jan.	19,297	16,070	29.2	27,418	July	14,342	14,298	30.4	28,058
Feb.	17,992	15,370	30.8	28,603	Aug.	17,213	14,224	28.3	29,786
Mar.	17,234	15,931	31.7	28,488	Sep.	16,428	14,589	29.1	30,287
Apr.	16,568	16,298	32.5	27,558	Oct.	19,358	16,528	29.3	32,118
May	17,552	15,719	30.5	28,397	Nov.	17,689	16,042	29.4	33,143
June	16,631	14,912	32.1	29,260	Dec.	19,297	17,109	30.3	34,701
1941:									
Jan.	20,413	18,636	29.0	35,344	July	.....	.....	...	.....
Feb.	19,507	17,793	29.2	37,104	Aug.	.....	.....	...	.....
Mar.	.....	.....	...	.....	Sept.	.....	.....	...	.....
Apr.	.....	.....	...	.....	Oct.	.....	.....	...	.....
May	.....	.....	...	.....	Nov.	.....	.....	...	.....
June	.....	.....	...	.....	Dec.	.....	.....	...	.....

Note: The above figures are based on the annual surveys conducted by the Leather and Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., with the exception of those for the current year which are estimates made by the Rubber Manufacturers Association. They are revised frequently and the latest available issue should always be consulted for the most reliable figures. The annual figures are more accurate. Stocks shown are those on hand at the end of the indicated month or year.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1939*	1940	1941		1939*	1940	1941
January	38,089	40,370	45,344	August	54,025	55,346	.....
February	34,928	37,557	42,253	September	49,505	52,297	.....
March	43,042	44,607	.....	October	49,854	53,807	.....
April	44,264	47,683	.....	November	47,407	49,074	.....
May	49,766	52,946	.....	December	43,807	46,413	.....
June	50,133	55,459	.....				
July	50,689	53,865	.....	Total	555,509	589,424	.....

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1929	24,141,502	1933	8,713,962	1937	22,257,964
1930	17,364,096	1934	12,255,118	1938	10,612,138
1931	11,253,800	1935	18,664,107	1939	17,471,914
1932	6,261,336	1936	20,790,192	1940	19,378,558
1941		1941		1941	
January ...	2,032,121	May	.....	September .	.....
February ..	2,131,211	June	.....	October ...	.....
March	2,665,961	July	.....	November .	.....
April	.....	August	.....	December ..	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1939																																
Jan.	—	15¾	16¼	16¼	16	16	16	15⅞	15¾	16	15¾	15⅜	15¾	15⅜	—	15⅞	15⅜	15¾	15¾	15⅜	15¾	—	15⅞	15⅜	14¾	13½	15⅞	15¾	—	15⅞	15¾	15¾
Feb.	—	15½	15¾	15¾	—	15¾	15¾	15¾	15½	15¾	15½	—	—	16	—	16	16⅛	16	15¾	15¾	15¾	—	16⅛	16	14¾	—	16½	15¾	—	—	—	15¾
March	—	16⅛	16⅜	16¼	—	16	16⅛	16¼	16¼	16¼	16¼	—	16½	16⅛	—	16⅛	16	16	15¾	15¾	15¾	—	16⅛	15⅞	15⅜	—	16⅛	16⅛	—	15⅞	15⅞	16
April	—	15⅞	16¼	16¼	—	—	—	—	16⅛	16⅛	—	—	15¾	15¾	—	15¾	15¾	15¾	15¾	15¾	15¾	—	16⅛	15⅞	15⅜	—	16⅛	16⅛	—	16⅛	16⅛	16⅛
May	—	15⅞	16	15¾	16	16	16⅛	16	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	15⅞	—	16⅝	16⅝	—	—	—	16⅛
June	—	16⅛	—	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
July	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
August	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
September	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
October	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
November	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
December	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
1940																																
January	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
February	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
March	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
April	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
May	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
June	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
July	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
August	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
September	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
October	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
November	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
December	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
1941																																
January	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
February	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
March	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛
April	—	16⅛	16⅜	16¼	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅛	16⅛	—	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	—	16⅝	16⅛	16⅛	—	16⅝	16⅝	—	—	—	16⅛

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Markets)

Average Price per Pound for Years 1913-1932

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98
1915	65.85	1919	48.70	1923	29.45	1927	37.72	1931	6.17
1916	72.50	1920	36.30	1924	26.20	1928	22.48	1932	3.49
1917	72.23	1921	16.36	1925	72.46	1929	20.59	1933	5.96

Average Monthly Price per Pound Since 1933

	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents	1939 Cents	1940 Cents	1941 Cents
Jan.	9.32	13.10	14.35	21.37	14.63	15.75	19.06	19.88
Feb.	10.45	12.92	15.48	21.33	14.71	15.93	18.83	20.43
Mar.	11.01	11.51	15.89	24.09	13.55	16.26	18.58	22.17
Apr.	12.10	11.55	15.98	23.44	11.84	15.87	19.16	
May	13.26	12.05	15.62	21.14	11.57	16.07	21.21	
June	13.51	12.57	15.85	19.29	12.57	16.37	22.20	
July	14.60	12.10	16.49	18.86	15.37	16.51	21.12	
Aug.	15.47	11.98	16.25	18.37	16.08	16.67	19.62	
Sept.	15.36	11.55	16.46	18.55	16.15	21.24	19.28	
Oct.	13.96	12.62	16.55	16.28	16.89	19.89	20.33	
Nov.	13.04	13.15	17.97	14.60	16.24	20.21	21.04	
Dec.	12.98	13.28	20.01	15.41	16.05	20.01	20.76	
Average for Year	12.92	12.37	16.41	19.39	14.64	17.57	20.10	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1941 Jan.	1941 Feb.	1941 Mar.	1941 Apr.	Day	1941 Jan.	1941 Feb.	1941 Mar.	1941 Apr.
1	—	—	—	14 5/16	16	12 1/4	—	—	
2	12 3/16	—	—	14 5/16	17	12 3/16	12 1/16	14 5/16	
3	12 3/8	12 3/16	13 1/16	14 5/16	18	—	12 7/8	14 5/16	
4	—	12 1/16	13 1/16	14 5/16	19	—	13	14 7/16	
5	—	12 1/16	13 3/4	—	20	12 3/16	12 1/16	14 7/16	
6	12 3/8	12 1/16	13 5/8	—	21	12 1/16	13	14 7/16	
7	12 1/2	12 1/16	13 5/8	14 3/16	22	12 3/8	—	—	
8	12 1/2	—	—	14 5/16	23	12 3/8	—	—	
9	12 7/16	—	—	14 1/4	24	12 1/16	13 1/16	14 5/16	
10	12 1/16	12 1/16	13 3/8		25	—	13 1/8	14 5/16	
11	—	12 1/2	13 1/2		26	—	13 1/8	14 7/16	
12	—	12 1/2	13 3/4		27	12 1/2	13 1/8	14 7/16	
13	12 7/16	12 1/2	13 11/16		28	12 1/2	13 1/4	14	
14	12 3/8	12 11/16	13 3/4		29	12 1/2	—	—	
15	12 3/8	—	—		30	12 1/2	—	—	
					31	12 1/16	—	14	

Average Monthly Price Per Pound

Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence	Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence
Jan.	7.077	7.926	11.793	12.415	Aug.	7.841	8.545	12.818	
Feb.	7.029	7.942	12.577	12.769	Sept.	7.918	9.634	11.964	
Mar.	6.590	8.120	11.651	13.967	Oct.	8.355	10.177	11.813	
Apr.	5.793	7.910	10.980		Nov.	8.111	11.210	11.801	
May	5.632	8.002	11.600		Dec.	8.005	11.559	11.963	
June	6.147	8.216	13.046		Average for Year.	7.164	8.959	12.035	
July	7.464	8.271	12.410						

Note: No quotations were made in the London market from June 17 through June 30. Accordingly, the average for the month is based on the first eleven trading days only.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1941 Feb.	1941 Mar.	1941 Apr.	Date	1941 Feb.	1941 Mar.	1941 Apr.	Date	1941 Feb.	1941 Mar.	1941 Apr.
1	10.90	10.90	11.48	11	10.91	11.07		22	—	11.11	
2	—	—	11.54	12	—	11.00		23	—	—	
3	10.91	10.83	11.70	13	10.87	11.02		24	10.90	11.09	
4	10.87	10.79	11.53	14	10.77	11.10		25	10.97	11.11	
5	10.86	10.81	11.58	15	10.69	11.14		26	10.91	11.15	
6	10.91	10.82	—	16	—	—		27	10.90	11.20	
7	10.89	10.87	11.51	17	10.70	10.95		28	10.94	11.35	
8	10.92	10.88	11.39	18	10.76	11.14		29	—	11.61	
9	—	—	11.40	19	10.80	11.20		30	—	—	
10	10.94	11.11		20	10.93	11.09		31	—	11.58	
				21	10.86	11.15					

Average Monthly Price Per Pound

	1938 Cents	1939 Cents	1940 Cents	1941 Cents		1938 Cents	1939 Cents	1940 Cents	1941 Cents
Jan.	8.57	8.94	11.19	10.66	Aug.	8.41	9.30	9.84	
Feb.	8.91	8.97	11.10	10.87	Sept.	8.17	9.30	9.69	
Mar.	8.92	9.00	10.90	11.08	Oct.	8.61	9.24	9.62	
Apr.	8.76	8.87	10.89		Nov.	9.08	9.73	9.97	
May	8.50	9.56	10.33		Dec.	8.72	10.97	10.18	
June	8.38	9.88	10.72		Average for Year	8.66	9.46	10.40	
July	8.85	9.71	10.42						

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of	ON HAND 1939	1940	1941	AFLOAT 1939	1940	1941	TOTAL 1939	1940	1941
Jan.	220,727	142,368	340,857	48,210	90,285	153,169	268,937	232,653	494,026
Feb.	207,882	134,328	353,733	55,814	112,257	136,955	263,696	246,585	490,688
Mar.	201,752	142,414		55,981	113,619		257,733	256,033	
Apr.	188,074	162,459		57,918	102,557		245,992	265,016	
May	187,980	161,446		54,046	109,364		242,026	270,810	
June	173,493	168,235		51,274	119,138		224,767	287,373	
July	165,450	190,222		52,990	139,629		218,440	329,851	
Aug.	152,029	213,002		66,717	141,286		218,746	354,288	
Sept.	136,824	241,358		68,310	137,033		205,134	378,391	
Oct.	119,404	259,140		100,500	166,837		219,904	425,977	
Nov.	105,205	276,943		114,044	158,095		219,249	435,038	
Dec.	125,800	318,486		91,095	145,950		216,895	464,436	

STOCKS IN GREAT BRITAIN

(No. of Tons in Wharves and Warehouses, not including Latex)

At end of	London 1938	1939	1940	Liverpool 1938	1939	1940
January	40,203	51,420	12,000*	21,711	28,789	8,000*
February	46,596	48,312	10,000*	24,737	26,784	7,000*
March	50,233	46,768	10,000*	26,220	24,996	8,000*
April	54,296	44,760	12,000*	28,277	23,742	10,000*
May	57,194	43,454	12,000*	29,862	22,211	9,000*
June	60,307	42,374	11,000*	31,837	21,176	8,500*
July	62,236	37,772	15,500*	32,825	19,116	11,000*
August	65,113	28,363	20,000*	34,315	16,218	16,000*
September	63,321	24,965*		34,645	14,054*	
October	59,609	23,685*		33,483	13,336*	
November	57,794	23,244*		32,116	13,087*	
December	55,668	19,545*		31,012	11,006*	

* Estimated.

(Figures up to August, 1939, from the Rubber Trade Association of London)

STOCKS IN OTHER CENTRES

(Figures from Statistical Bulletin of the Int'l Rubber Regulation Committee)

	Penang and Singapore [1]	Malaya [2]	Ceylon [2]	Holland	Para and Manaos
At end of 1940					
January	35,928	60,504	5,755	....	2,862
February	33,563*	52,615	4,452	....	2,869
March	23,830*	48,180	3,369	....	3,246
April	42,239	50,656	4,749	....	2,715
May	32,731*	45,715	3,774	....	1,743
June	32,375*	45,618	5,057	....	1,706
July	36,716*	43,850	4,392	....	1,667
August	40,395*	39,950	4,460	....	1,580
September	29,069	44,730	3,549	....	2,559
October	33,638	42,239	4,060	....	3,084
November	33,778	43,693	6,258	....	3,697
December	26,773	48,787	5,806	....	2,165
At end of 1941					
January	37,163	.....	6,917	....	2,151

[1] Dealers' and Port Stocks. [2] Inside Regulated Areas. [3] Dealers' Stocks Only. * Revised.

RUBBER STOCKS AFLOAT

End of: 1940	Afloat for United States	Afloat for Europe	All Other Afloat	Total Afloat
February	112,257	40,000	40,743	193,000
March	113,619	45,000	52,381	211,000
April	102,557	45,000	40,443	188,000
May	109,364	45,000	55,636	210,000
June	119,138	50,000	65,862	235,000
July	139,629	55,000	55,371	250,000
August	141,286	55,000	53,714	255,000
September	137,033	60,000	67,967	265,000
October	166,837	60,000	38,163	265,000
November	158,095	60,000	31,905	250,000
December	145,950	60,000	44,050	250,000
End of: 1941				
January	153,169	60,000	51,831	265,000
February	136,955	.....	.....	.....

Note: *Total Afloat* figures are estimated at 1½ months' world shipments by the International Rubber Regulation Committee. *Afloat for U. S.* is supplied by the Rubber Manufacturers Association. *Afloat for Europe* is estimated. *All Other Afloat* is determined by subtraction.

TOTAL PRINCIPAL WORLD STOCKS

At End of:	1936	1937	1938	1939	1940	1941
January	600,479	454,249	549,762	497,665	433,841	645,171
February	599,355	445,265	565,833	479,578	429,551	.....
March	583,318	447,856	586,666	460,723	447,472	.....
April	567,172	428,249	586,291	438,252	465,345	.....
May	541,871	413,134	568,158	429,979	470,981	.....
June	520,255	434,250	573,136	407,640	500,774	.....
July	519,074	445,782	580,654	418,639	547,708	.....
August	500,520	457,462	565,394	397,345	579,119	.....
September	493,585	470,768	551,447	396,867	631,888	.....
October	486,159	479,398	540,976	413,274	651,775	.....
November	466,491	493,266	512,196	395,217	659,308	.....
December	466,576	545,533	482,852	391,125	702,089	.....
Monthly Avge.	528,738	460,022	555,280	427,192	543,321	.....

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,635	13,437	13,355	11,376	15,565	7,314	13,946	14,849
Apr.-June	14,412	13,565	12,597	14,892	15,834	7,380	13,759	15,711
July-Sept.	14,707	9,822	11,312	14,914	12,207	10,794	15,182	13,875
Oct.-Dec.	9,550	10,406	12,099	14,858	9,704	12,360	14,726	14,919
Total	45,304	47,230	49,363	56,040	53,310	37,848	57,613	59,354

Shipment Figures on Quarterly Basis

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,981	10,730	11,154	10,554	14,143	7,388	12,445	12,728
Apr.-June	15,139	14,998	13,473	15,940	15,741	9,564	15,107	17,657
July-Sept.	13,707	11,648	13,489	14,037	13,106	11,243	15,791	13,101
Oct.-Dec.	8,265	9,310	12,066	12,855	10,495	12,098	14,165	15,670
Total	44,092	46,686	50,182	53,386	53,485	40,293	57,508	59,156

Inventory Figures [2]

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	7,290	11,651	11,675	8,762	12,004	10,547	9,963	10,747
Apr.-June	6,615	10,219	10,755	7,556	12,081	8,337	8,632	8,881
July-Sept.	7,595	8,419	8,288	8,690	11,200	7,859	8,080	9,890
Oct.-Dec.	8,888	9,455	8,196	10,717	10,383	8,166	8,665	9,179

Figures for Recent Months

	PRODUCTION 1939	1940	1941	SHIPMENTS 1939	1940	1941	INVENTORY [2] 1939	1940	1941
Jan.	4,546	4,954	5,472	4,149	4,270	4,847	8,863	9,348	9,797
Feb.	4,309	4,888	5,165	3,731	4,112	4,910	9,475	10,124	10,072
Mar.	5,091	5,007	....	4,565	4,346	....	9,963	10,747	....

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,230	12,823	12,553	11,891	15,831	7,314	12,383	12,815
Apr.-June	13,001	13,191	11,631	14,624	15,413	7,380	11,847	13,744
July-Sept.	14,356	10,321	11,270	15,320	12,038	10,794	13,118	12,469
Oct.-Dec.	9,000	9,891	12,425	15,201	9,092	12,360	13,300	13,333
Total	42,587	46,226	47,879	57,036	52,374	37,848	50,648	52,361

Shipment Figures on Quarterly Basis

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,539	10,640	11,252	11,367	14,606	7,387	11,422	11,684
Apr.-June	13,292	14,553	11,928	15,113	15,495	9,564	13,010	15,003
July-Sept.	13,370	11,545	13,251	15,069	12,901	11,243	13,449	11,403
Oct.-Dec.	8,189	8,306	11,636	12,874	9,765	12,099	13,309	14,216
Total	41,390	45,044	48,067	54,423	52,767	40,293	51,190	52,306

Inventory Figures [2]

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,369	10,244	10,406	8,660	11,993	10,547	8,752	8,247
Apr.-June	6,097	8,795	10,050	8,075	11,833	8,337	7,549	6,841
July-Sept.	7,008	7,639	7,565	8,595	11,326	7,859	7,206	7,950
Oct.-Dec.	7,815	9,180	8,231	10,945	10,312	8,166	7,036	7,014

Figures for Recent Months

	PRODUCTION 1939	1940	1941	SHIPMENTS 1939	1940	1941	INVENTORY [2] 1939	1940	1941
Jan.	4,097	4,260	5,168	3,943	3,805	4,527	7,932	7,490	7,733
Feb.	3,795	4,184	4,993	3,401	3,788	4,713	8,298	7,886	8,004
Mar.	4,492	4,371	....	4,078	4,091	....	8,752	8,247	....

[1] These figures are based on reports received from the Rubber Manufacturers Association. They are revised frequently and the latest available issue should be consulted for most reliable figures.
[2] Stocks held by manufacturers at end of period indicated.

Automobile Production

Year	United States Total	Passenger Cars	Trucks	Canada Total	Passenger Cars	Trucks	Grand Total
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937	4,808,974	3,915,889	893,085	207,463	153,046	54,417	5,016,437
1938	2,489,085	2,000,985	488,100	166,086	123,761	42,325	2,655,171
1939*	3,577,292	2,866,796	710,496	155,426	108,369	47,057	3,732,718
1940	4,469,354	3,692,328	777,026	222,984	110,126	112,858	4,692,338
1940							
July	231,703	168,769	62,934	14,468	3,397	11,071	246,171
August	75,873	46,823	29,050	13,993	1,510	12,483	89,866
September	269,108	224,470	44,638	15,475	3,410	12,065	284,583
Oct.	493,323	421,214	72,009	21,151	7,056	14,095	514,374
Nov.	487,352	407,091	80,261	23,621	10,814	12,807	510,973
Dec.	483,567	396,531	87,036	23,364	11,653	11,711	506,931
1941							
Jan.	500,931	411,258	89,673	23,195	11,990	11,205	524,126
Feb.	485,523	394,483	91,040	23,710	10,647	13,063	509,233
Mar.	.....	.....	.....	.....	.....	.....	.....

* Revised.
Note: U. S. figures represent factory sales; Canadian, production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA							NETHERLAND INDIES						
	Gross Exports	Imports	Net Exports	Ceylon	India & Burma	Sarawak	British North Borneo	Thailand	Java & Madura	Sumatra E. Coast	Other N.I.	Indo-China	Amazon Valley	All Other	World Total
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,415
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,536
1927	371,322	182,845	188,477	55,336	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,436	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	31,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,105	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	5,551	84,085	139,632	207,863	43,399	15,576	13,063	1,133,864
1938	526,911	156,101	370,810	49,528	15,179	17,792	9,512	41,080	57,526	94,501	145,909	58,518	14,618	12,920	887,892
1939	553,324	177,851	375,473	61,026	15,881	24,014	11,864	41,266	72,786	117,791	181,272	65,140	13,892	22,224	1,002,629

	British Malaya [1]	N.E.I.	Ceylon [2]	India & Burma [2]	North Borneo	Sarawak	Thailand	Indo-China	Oceania	Africa [3]	Liberia	South America	Mexico (Guayule)	Grand Total
1940:														
Jan.	26,229	54,148	7,698	1,672	1,858	2,256	5,722	5,238	185	747	1,191	1,550	389	108,883
Feb.	45,651	37,958	8,946	2,922	1,164	2,678	4,307	6,931	94	834	477	1,662	239	113,863
March	47,885	42,355	5,305	1,941	1,050	3,526	3,111	3,551	178	943	548	1,482	346	112,221
April	25,454	44,416	4,144	1,807	1,799	2,951	1,834	2,927	203	720	598	1,159	317	88,329
May	57,874	40,436	7,337	2,018	1,370	2,696	2,582	4,578	195	961	364	2,305	331	123,047
June	45,471	44,834	5,603	1,553	1,421	4,077	2,178	2,730	168	727	405	1,080	101	110,348
July	42,861	60,482	7,330	1,194	1,767	2,494	4,253	4,045	169	800	342	1,035	443	127,215
Aug.	45,872	45,078	8,139	1,332	1,593	2,640	4,545	7,337	285	800	308	1,233	327	120,729
Sept.	58,892	44,009	9,985	1,319	1,743	2,404	3,247	9,303	100	800	323	1,295	200	133,715
Oct.	52,767	50,139	8,127	1,841	1,693	2,564	3,355	2,082	200	800	600	1,860	200	126,228
Nov.	36,045	37,387	5,623	2,626	1,130	3,360	3,463	6,715	200	800	600	1,500	200	99,649
Dec.	56,263	35,325	10,700	3,405	1,028	3,520	5,343	9,000	200	600	813	1,427	392	128,216
1941:														
Jan.	37,804	58,926	7,866	2,434	2,085	2,445	2,137	9,058	250	600	750	2,103	250	126,908

(1) Including Brunei and Labuan; figures shown represent rubber which has actually been shipped and include rubber from the free stocks in Singapore and Penang. (2) Exports of domestic produce. (3) Exclusive of Liberia. Notes: Figures shown prior to 1940 were furnished by the United States Department of Commerce. Figures since 1940 were furnished by the International Rubber Regulation Committee, which accounts for the difference in the principal producing countries shown. Many figures for current months are provisional only and are later revised when more definite statistics are available. Therefore, it is suggested that figures from the most recent issue should be taken as more reliable.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	73	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,296	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,391	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,363	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	30,462	19,164	14,970	4,343	4,680	2,400	13,063	1,055,356
1938	406,343	133,079	59,660	90,200	25,696	45,836	28,170	25,650	11,944	11,309	5,092	16,034	2,400	9,936	871,349
1939	486,348				31,615	42,352			15,426	9,612	7,051				
1939:															
May	45,390	7,531	4,646	8,413	3,006	4,438	1,573	2,000*	1,188	792	518	1,654	200*	618	81,967
June	33,951	8,439	4,649	8,190	2,423	3,067	1,992	2,000*	1,308	621	672	2,703	200*	487	70,702
July	36,932	4,040	4,282	8,437	3,164	3,668	1,408	1,000*	1,422	859	565	824	200*	412	67,153
Aug.	38,319	2,044	4,000*	....	2,033	3,145	1,500*	2,000*	2,182	952	651	1,546	200*	400*	58,972
Sept.	36,197	4,406	4,000*	....	2,639	9,254	1,500*	2,000*	875	108	222	1,200*	200*	...	62,601
Oct.	39,735	8,530	5,000*	....	5,787	2,749	1,500*	2,000*	1,235	519	653	1,200*	200*	...	69,108
Nov.	41,478	10,500*	5,000*	....	1,709	5,104	1,500*	2,000*	1,200*	667	613	1,200*	200*	...	71,171
Dec.	70,302	5,200*	5,000*	....	3,025	3,961	1,500*	2,000*	1,200*	1,035	1,827	1,200*	200*	...	96,450
1940:															
Jan.	71,565	450	5,000*	....	5,047	4,540	1,500*	2,000*	1,921	891	682	1,200*	200*	....	....
Feb.	41,797	7,500	5,000*	....	3,508	5,241	1,500*	2,000*	1,846	694	495	1,200*	200*	....	....
Mar.	58,302	14,200	5,000*	....	3,062	6,057	1,500*	2,000*	1,784	....	627	1,200*	200*	....	....
Apr.	70,135	16,400	5,000*	....	3,096	2,000*	1,500*	2,000*	1,612	....	....	1,200*	200*	....	....
May	50,610	10,000	5,000*	....	3,108	2,500*	1,500*	2,000*	2,128	....	....	1,200*	200*	....	....
June	53,266	9,500	5,000*	....	1,062	3,000*	1,500*	2,000*	1,181	....	....	1,200*	200*	....	....
July	69,496	19,500	5,000*	....	5,112	3,000*	1,500*	2,000*	1,902	....	....	1,200*	200*	....	....
Aug.	72,612	21,250	5,000*	....	4,605	4,500*	1,500*	2,000*	2,508	....	....	1,200*	200*	....	....
Sept.	78,306	25,940	5,000*	....	2,743	....	1,500*	2,000*	2,485	....	....	1,200*	200*	....	....
Oct.	74,400	.....	5,000*	....	....	....	1,500*	2,000*	1,590	....	....	1,200*	200*	....	....
Nov.	72,775	.....	5,000*	....	....	....	1,500*	2,000*	1,200*	....	....	1,200*	200*	....	....
Dec.	.....	.....	....	....	....	....	....	....	....	....	....	....	....	....	....

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1]—United States imports of guayule are included in this compilation. *—Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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